OCTOBER 28, 1957

STEEL
The Metalworking Weekly

A PENTON PUBLICATION

Metal Selector
1957 STEEL
October 28, 1957
Here is the practical information needed to help you select the right metal for the job. The more special alloys, covered last year, will be brought up to date in 1958
COPPER Wrought Alloys

Metal Show Issue

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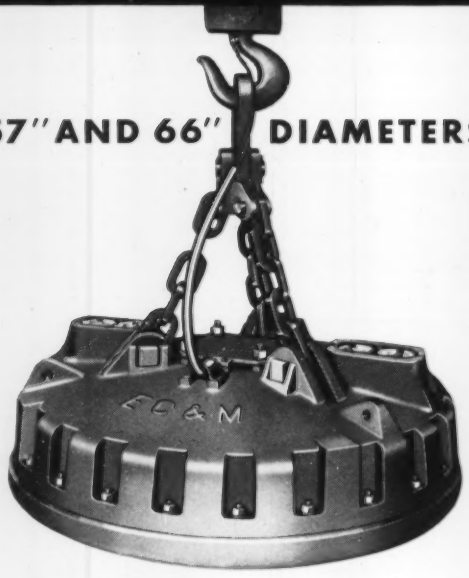
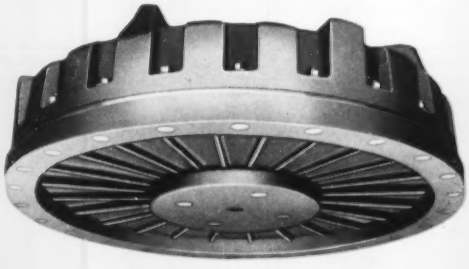
2 New Bolted LIFTING MAGNETS by EC&M

57" AND 66" DIAMETERS





New throughout, these EC&M **Type SB Lifting Magnets** have many improvements over previous-design bolted magnets. They are mechanically stronger, have improved coil construction, and high lifting capacity due to a better magnetic path. Tapered-head, through bolts simplify field replacement of worn pole shoes... permit quick access to coil.

Strap aluminum coil winding is firmly anchored by top-plate held by bolts and screws. Continuous welds seal coil spool in magnet case and make it water-tight. Welds are easily ground or chipped off for field removal of coil.

Coil-leads terminate in separate chambers, 180° apart. The magnet is freed of moisture and completely filled, through these two chambers, with self-polymerizing, insulating compound.

Chains, the same as used on large EC&M ALL-WELDED Magnets, are of 3-leg design with links of cast manganese steel terminating in a forged crane link for easy hook-on.

EC&M BOLTED MAGNETS complement the complete line of EC&M ALL-WELDED Magnets • For all the facts, Write for Bulletin 1300 SB

THE ELECTRIC CONTROLLER & MFG. CO.
A DIVISION OF THE SQUARE D COMPANY
CLEVELAND 28 • OHIO

EC&M'S 60TH ANNIVERSARY • 1897-1957

9251

He'll settle for perfection, nothing less

While a keyway is being milled in the neck of this hardened steel roll, the Bethlehem machinist is taking a final reading on the bearing diameter. Sure, it's been checked before, but he wants to be absolutely certain.

Despite the expert machining that is a part of every Bethlehem roll, inspections are numerous and thorough. The whole idea is to shoot for perfection.

The roll shown above will be used in the making of steel sheets and blackplate. It weighs in the neighborhood of 3½ tons; has a body length of 56 in. and a body diameter slightly over 21 in. The unit is typical of many that Bethlehem produces each year. But Bethlehem shops often make rolls weighing several times as much—as well as some so small that they can be lifted by hand. And all of them, large and small alike, receive the same careful workmanship, the same careful inspection.

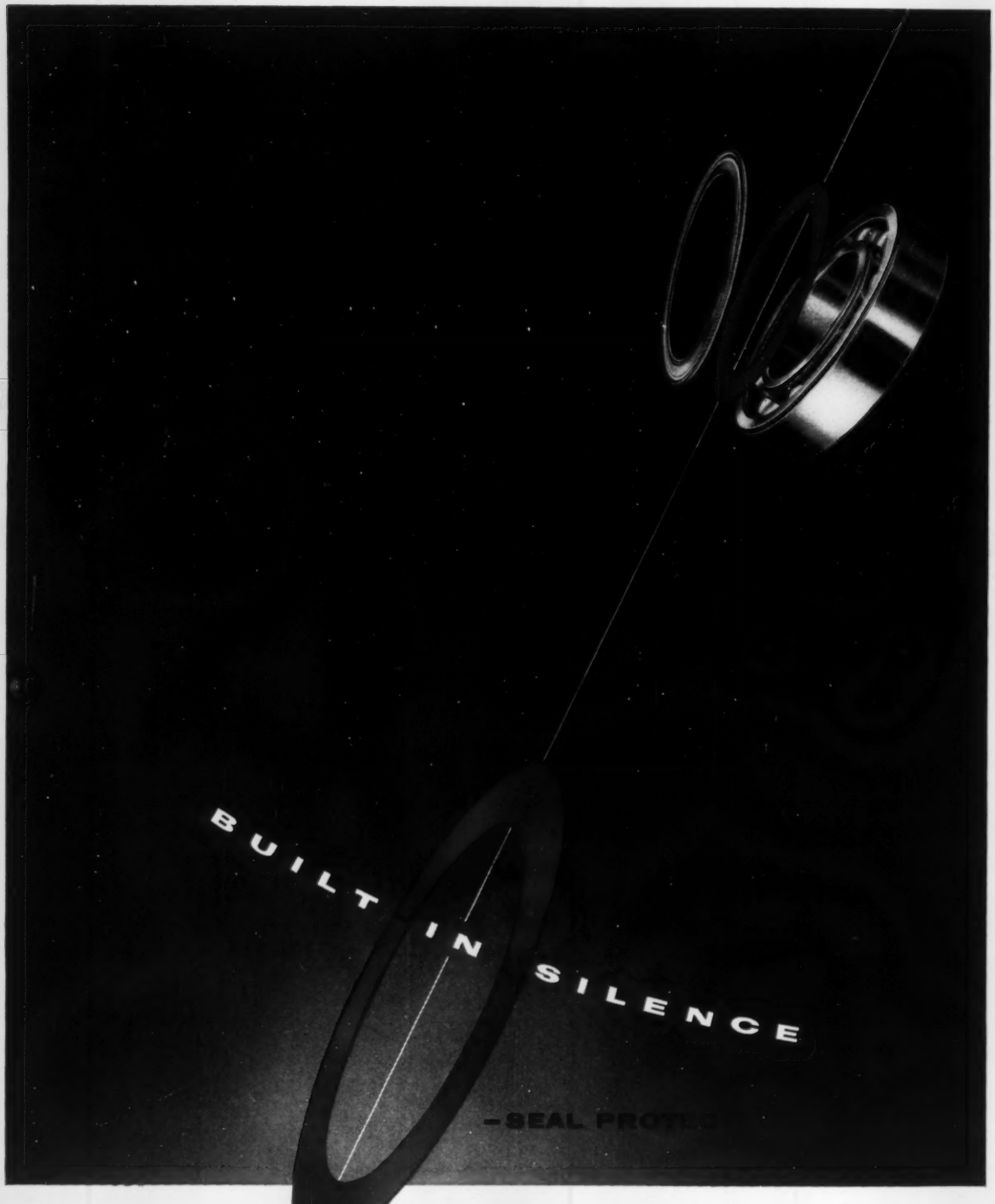
Whatever your requirements, Bethlehem can meet them in full. Call us whenever you need rolls for cold-rolling steel sheets and strip . . . running down and finishing steps on copper and brass sheets . . . hot- and cold-rolling aluminum sheets . . . cold-rolling aluminum foil.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



EVERY TYPE—EVERY USE

SKF®

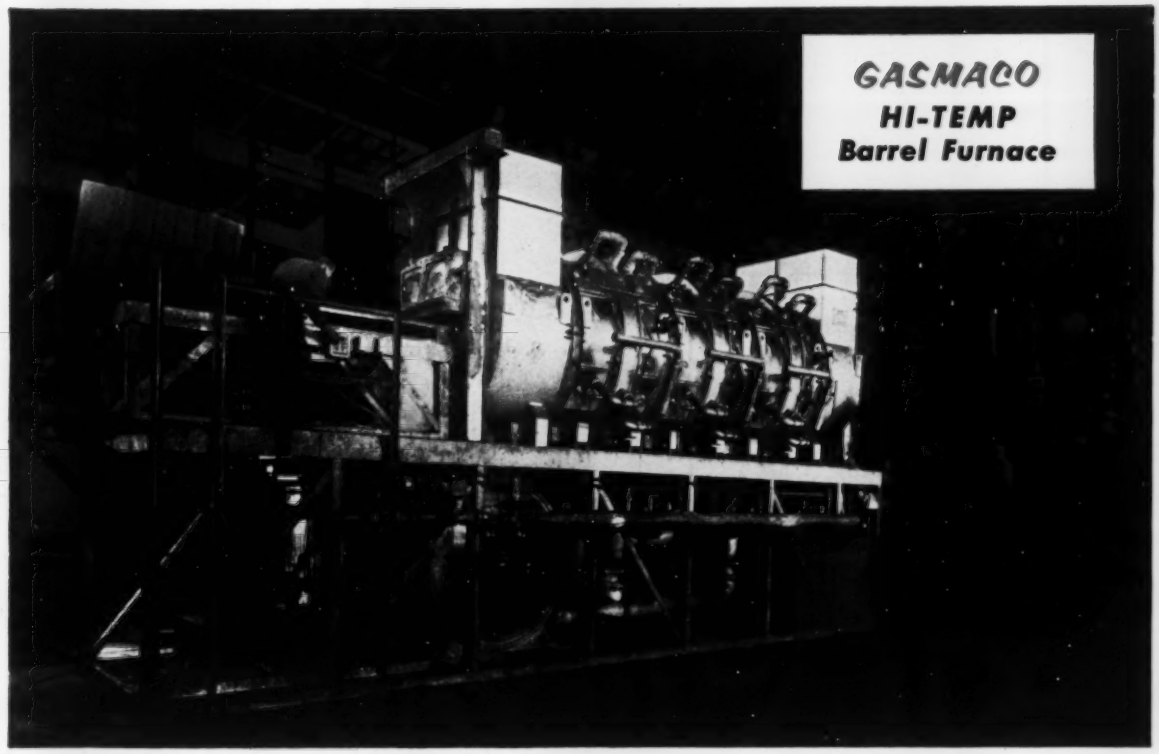
- *Ball Bearings*
- *Cylindrical Roller Bearings*
- *Spherical Roller Bearings*
- *Tapered Roller Bearings* ("Tyson")

7762

*Reg. U.S. Pat. Off. Tyson Bearing Corporation

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

The most silent rolling contact bearing in the world of today



GASMACO Hi-Temp Barrel Furnace Gives Hi-Speed Heating

This forge shop turned up the heat and cut down scale on a slug heating operation by installation of the Pusher-Type Furnace pictured. The furnace not only produced — but its unique design overcame high maintenance related to furnaces of this type. This furnace is ideal for any operation where short billets or slugs can be pushed end to end.

Hi-Speed Heating—2 Min/Inch

Extremely rapid heating minimizes scale.

Typical Operation:	Material:	4″ cubes — aircraft steel
	Production Rate:	8000 lbs./hr.
	Heating Time:	8 minutes
	Furnace Temperature:	2650° F.

Long Barrel Life

Application of radiant burners — thereby avoiding flame impingement on refractory — coupled with improved lining design — provides excellent life.

Automation

Automatic feed and discharge mechanism delivers hot billets to press at timed intervals.

Manpower minimized — plus automatic control of heating time.

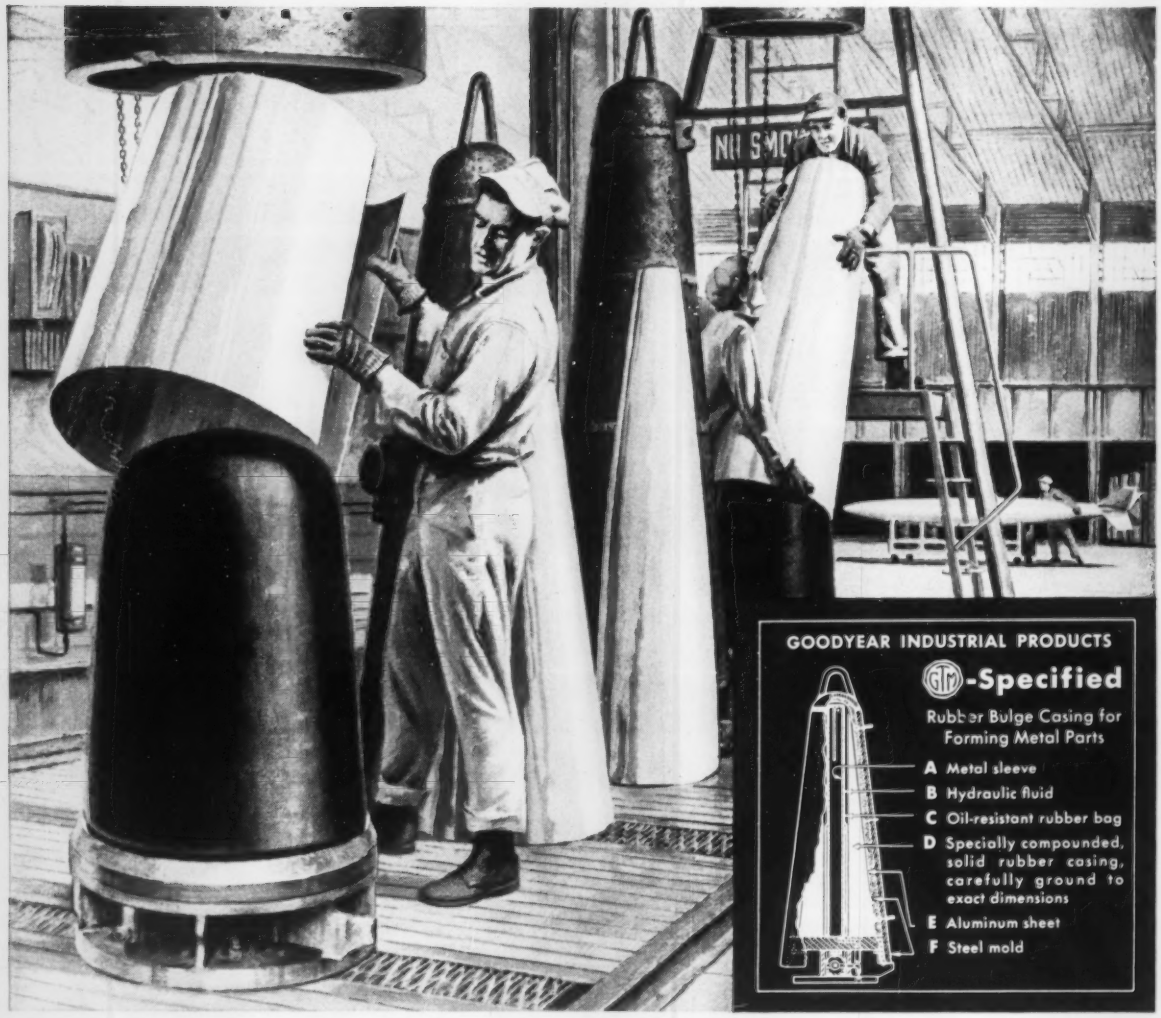
Proven Design

Extended operation under hi-production conditions adds this furnace to GASMACO's list of proven advanced equipment.

THE GAS MACHINERY COMPANY, 16138 Waterloo Road, Cleveland 10, Ohio. In Canada: The Gas Machinery Co. (Canada) Ltd., Hamilton, Ontario.

THE gas machinery COMPANY

GAS PLANT EQUIPMENT
INDUSTRIAL FURNACES
PROCESS EQUIPMENT


GOODYEAR INDUSTRIAL PRODUCTS
G.T.M.-Specified
Rubber Bulge Casing for Forming Metal Parts
A Metal sleeve
B Hydraulic fluid
C Oil-resistant rubber bag
D Specially compounded, solid rubber casing, carefully ground to exact dimensions
E Aluminum sheet
F Steel mold

A new "form" of profit!

Fuel tanks for jet fighters are produced faster and cheaper by the new process pictured above. It's the development of a Midwestern manufacturer and employs rubber "bulge casings"—expanded by hydraulic pressure—to form the tank sections against metal molds.

But the first bulge casings—made of rubber strips bonded together—broke apart after only 30 to 40 units had been formed. Repairs were difficult—didn't last. Finally they called in the G.T.M.—Goodyear Technical Man.

He soon had the answer. Calling on his experience with rubber-covered rolls, he came up with a special one-piece rubber casing with no seams to separate. And the rubber was especially compounded to withstand constant flexing. Result: At last report the G.T.M.'s casing had turned out *over 500 units without slightest sign of wear.*

Breaking through bottlenecks like this one—with special or standard industrial rubber products—is routine to the G.T.M. To turn his problem-solving ability loose on your tie-ups, just write

Goodyear, Industrial Products Division,
Akron 16, Ohio

GOODYEAR

THE GREATEST NAME IN RUBBER

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The Metalworking Weekly

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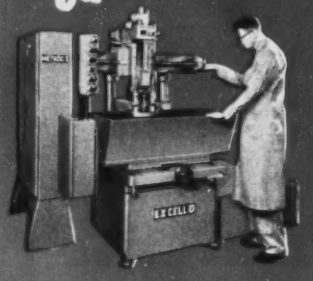
Cut intricate shapes of sintered carbides and super alloys with Method X.

Electrospark machining really cuts costs!



Ex-Cell-O Style 243-6 Method X Standard Vertical Electrospark Machine.

Electrospark machining of difficult-to-cut metals offers exceptional savings. Many shops, for example, find an Ex-Cell-O Method X Machine pays for itself by reducing scrap—you can correct mistakes even in hard carbides. An Electrospark Machine also cuts hardened steels and cast alloys. More information by contacting Ex-Cell-O, Detroit.

57-89

XLO EX-CELL-O FOR PRECISION

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

behind the scenes

Spiritual Tizzy

If any gnomes, sylphs, salamanders, or undines turn up in Chicago next week, they're going to find themselves out on a limb—that is, if we care to put any faith in a treatise written some years ago by a hot-shot scientist with the impossible name of Philippus Aureolus Theophrastus Bombastus von Hohenheim Paracelsus. The old boy held that there were four elements: Earth, air, fire, and water. Moreover, each element had its own reigning set of spirits, and if you played fast and loose with fire, for example, you could bring a mess of disturbed salamanders about your ears.

But to come back to Sorrento (Oops! That's what comes from overexposure to hi-fi). We mean Chicago: The 39th National Metal Exposition and 2nd World Metallurgical Congress opens in that city on Nov. 4, and so many elements will be represented in the metals and alloys on display the reigning spirits are bound to grow confused. The undines would claim jurisdiction over metals used in pens that write under water; gnomes, naturally, would look for rare earths; salamanders would hover over all the furnaces, and if the sylphs took to the air, particularly over the Union Stockyards, could you blame them for cooking up a curse?

Dig That Metal Selector

We approached STEEL's technical editor, Dr. Allen Gray, with a view toward learning something about metals and their attendant spirits. If there were only four sets in Paracelsus' time, surely there must be many more in these modern days.

"Doctor, in your opinion, what divinity will go to Chicago next week to reign over, say, the various commercial numbers, with corresponding ASTM and SAE designations and composition limits, of the more than 50 aluminum cast alloys?"

"I'm glad you asked me that," the good doctor replied, "because I haven't the faintest idea of what you're talking about. However, if you were to ask me about STEEL's Metal Selector for Standard Alloys, which appears as a ten-page insert in this week's Metal Show Issue, I could give you a story that would astound more than 50,000 metalworking executives and engineers."

"Tiens, parbleu, and heavenly days! Do you think this page might attract 50,000 metalworking executives and engineers?"

"Certainly not. I merely took the opportunity to mention the number of interested persons who will gather in Chicago for the Metal Show, and who will be much aroused by our Metal Selector. You know, we worked on the selector for more than five months."

Last year's Metal Selector drew an unprecedented response from readers and was judged the best original research in 1956 in the 19th Annual Editorial Competition sponsored by *Industrial Marketing*.

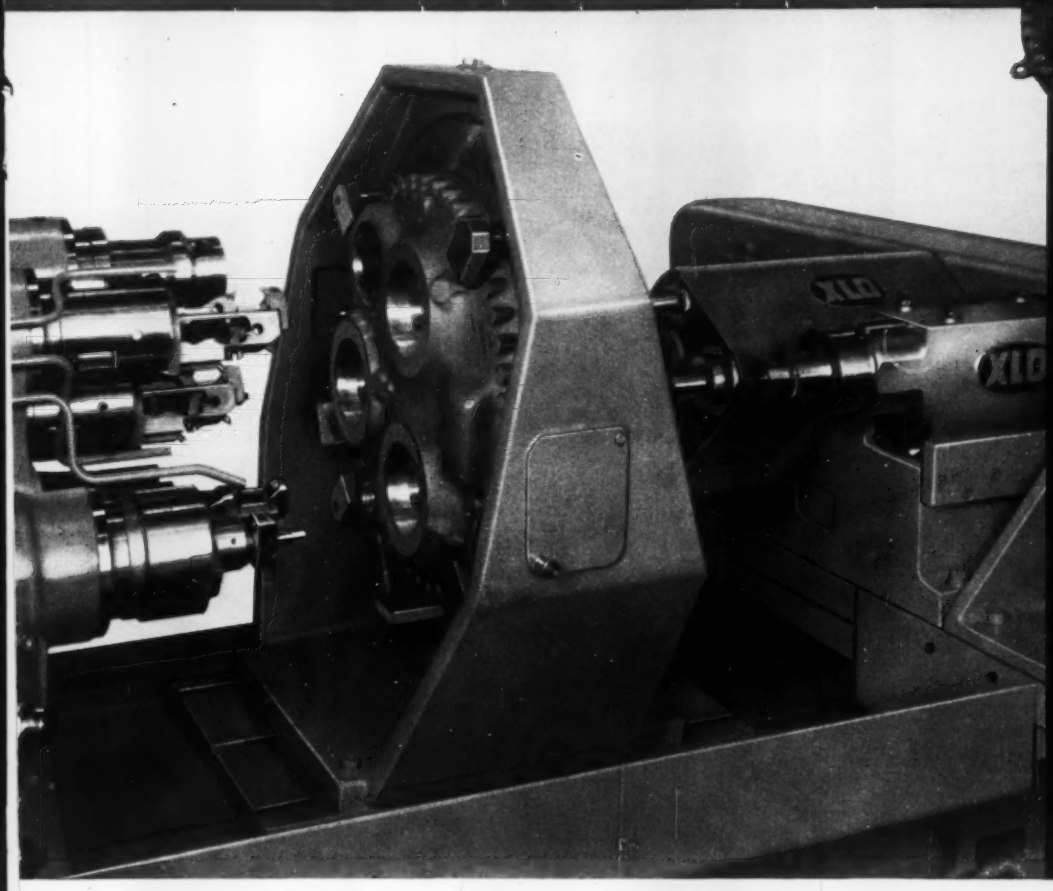
It was about time to change the subject, so we asked him about other features in this week's issue. "Reduction!" he exclaimed. "We have a special report on direct reduction of iron ores. Everybody's talking about it. Downright fascinating."

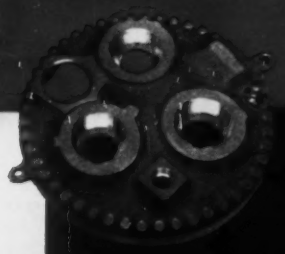
We felt a better subject, for downright fascination, might be the new bag silhouettes under which the modern miss foolishly conceals her naturally delightful lines, but Dr. Gray permitted himself a mild (but academic) snort. We dismissed the silhouettes in bags (the proofreader could kill us dead if he makes a sly transposition in that line) and pressed for more information on what direct ore reduction will mean to steel technology, but the only answer we got was: "Turn to Page 180."

You Can Do It

Everybody else was drinking, so Llewellyn picked up a handful of Scrabble letters. He had 8 As, 8 Ts, 2 Hs, 2 Ss, 2 Ds and 1 F, C, E, P, and G. He employed them to make an acceptable sentence, like this: "- - - -

How to precision finish 42 surfaces in one cycle





Back and front view of the bored casting. Part will eventually house a precision gear train. All hole sizes and locations are held to .001" tolerances.

Close-up of part mounted in its hydraulically-operated fixture. Notice straddle facing tools mounted on boring spindles.

XLO

EX-CELL-O FOR PRECISION

57-70

These magnesium cast aircraft gear housings are being bored, faced and chamfered, 42 precision operations overall in one cycle on a single Ex-Cell-O 17-A precision boring machine! What's more, all diameters and locations are being held to .001" tolerances.

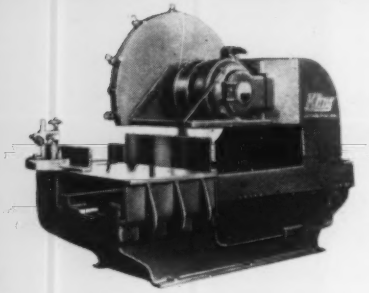
The ability of this and other Ex-Cell-O boring machines to perform multiple precision operations is recognized throughout the metalworking industry. This reputation, backed by years of leadership, is your assurance that precision boring is best done by an Ex-Cell-O machine.

For full information on the complete line of Ex-Cell-O precision boring machines, including the one best suited to your production standards, get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

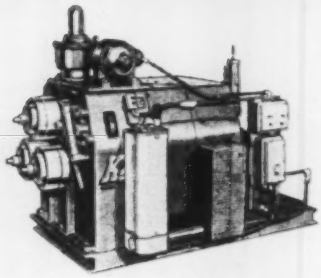
EX-CELL-O CORPORATION *Machinery Division*

DETROIT 32, MICHIGAN

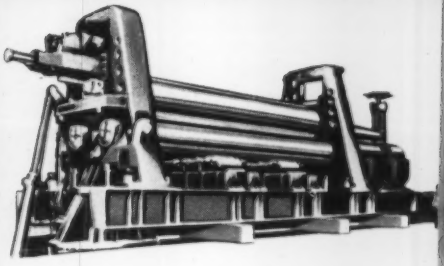
MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT



KLING FRICTION SAWS. "On 80 lb. rails we get from 800 to 1200 cuts per day."



KLING ANGLE BENDING ROLLS. "True Diameters...larger capacity, faster production"



KLING PLATE BENDING ROLL (PYRAMID TYPE). "Our experience with Kling proves that the Kling Pyramid Roll is easy to operate."

RIGHT out of the horse's mouth!

As relayed to us by production men from coast to coast! These are just samples—why not hear the whole story!

KLING SHEARS
"Now getting 16 hours work from an 8 hour shift."

KLING COMBINATIONS
"Does the work of half dozen machines . . . works two shifts in one!"

KLING FRICTION SAWS
"Could not handle our volume of structural cutting with one machine of any other kind presently on the market."

KLING PLATE ROLLS
"Plate speeds up to 30 feet per minute achieved."

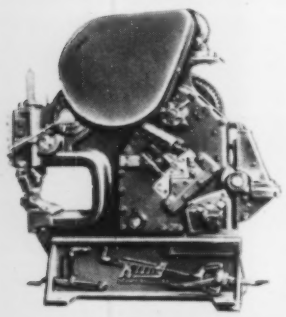
KLING UNIVERSAL PUNCHES
"Does more accurate work at less cost . . . replaced two other make *machines."*

KLING PUNCHES
"Much more versatile machine, increased punching capacity."

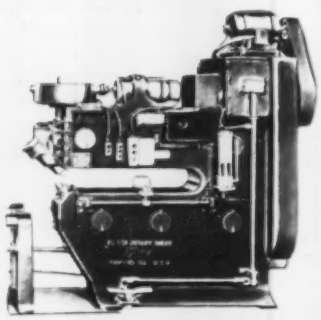
KLING ANGLE ROLLS
"Truer diameter . . . larger capacity . . . faster production."

KLING MILL-ALLS
"Cut up to 1000% faster with exceptional ease—steel, aluminum, etc."

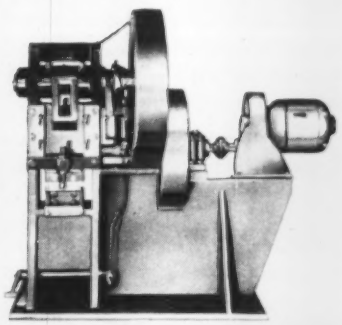
KLING COMBINATIONS. "Versatility makes them ideal for short runs, too!"

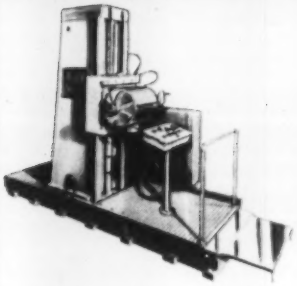


KLING ROTARY SHEARS. "6 sizes and various attachments enabled us to get a shear machine custom built for our needs."

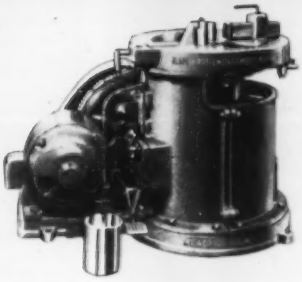


KLING GUILLOTINE SHEARS. "Does the job faster...neater; safety features liked by men."

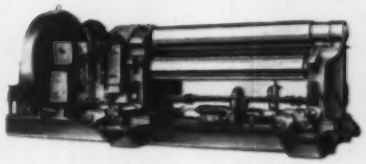




KLING MILL-ALL. "Cuts faster with a finish that is better than most commercially-milled finishes."



KLING POWER BAR BENDERS. "15 bends a minute for 1⅛ inch round is easy..."



KLING PLATE BENDING ROLL (PINCH TYPE). "Work is better controlled. Flats are held to a minimum."

Kling

Workhorses

Speak the language Production Men Love to Hear

The men who operate Kling Machines get the performance facts straight from the Workhorses' mouths. They're relaying these facts to us... and they're the kind of facts any production man would love to hear... so we're reproducing a few typical samples on these pages... in the hope they'll whet your appetite for more. They will add up to...

Better Work... Faster Work... Easier Work Lower Costs

Ask the Men Who Know KLING BEST

You'll find KLING machines in "the Best of Companies"... and the production men in these companies are Kling's best friends. They know Kling performance first hand... they have the facts right out of these Workhorses' mouths! Why not ask us to send you the names of Kling users near you... see a Kling Workhorse in action... you'll hear the language every production man loves to hear! And mail the coupon now... for Bulletins on any or all of these Kling Workhorse machines.

You'll find Kling Workhorses in "the Best of Companies."

Bethlehem Steel... B&O Railroad

Ford Motor... Kaiser Steel

Link Belt... Jos. T. Ryerson

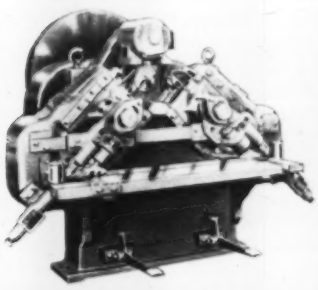
U. S. Steel... Douglas Aircraft

Westinghouse... Lockheed

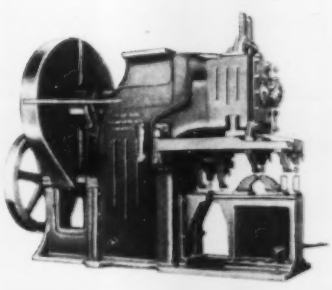
Allis Chalmers... Reynolds Metals

Pearl Harbor Shipyard... etc.

KLING DOUBLE ANGLE SHEARS. "Saves 75% of Labor compared to our old method ...less burr, too."



KLING PUNCHES. "Our 2 have run 16 hours a day for 20 years."



Kling Bros. Engineering Works
1320 N. Kostner Ave., Chicago 51, Ill.

I'd like to know more about the following Kling Machines... send me Catalog Bulletins.

- ☐ Combination Shear Punch and Coper
- ☐ Plate Rolls
- ☐ Punches
- ☐ Shears
- ☐ Angle Rolls
- ☐ Bulldozers
- ☐ Friction Saws
- ☐ Rotary Shears
- ☐ Power Bar Benders
- ☐ Mill-All

☐ Also, names of companies near me whom I can contact for on-the-job performance results.

(attach to your letterhead)

Export Distributor: Simmons Machine Tool Corp., 50 E. 42nd St., New York 17
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Your Bunting distributor is listed in the classified section of your telephone directory usually under Bars—Bronze, and Bearings—Bronze. Two modern Bunting factories and eleven Bunting Branch Warehouses expedite distribution in all areas. Write, or ask for catalogs giving complete dimensional listings and technical data.

All Bunting Sintered Bronze Plain and Flange bearings stamped with part number—an exclusive Bunting feature.

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LETTERS TO THE EDITORS

Unions Influence Inflation

The stories of inflation published in recent months are both interesting and disquieting.

Your story, "Prices Rise When Wages Outrun Productivity" (Sept. 30, Page 45), is good but does not go far enough.

The present inflationary trend stems from the desire of union leaders to secure a greater increase in wages (and more fringe benefits) for their unions than other labor leaders could secure.

For that purpose, unions have accumulated huge funds, from which prolonged strikes can be financed.

In my opinion, inflation can be halted only by a law that makes strikes unpopular. That law consists of one sentence: An employee who goes on strike shall be considered to have left his (or her) employment voluntarily and shall be considered a new employee, when seeking employment anywhere.

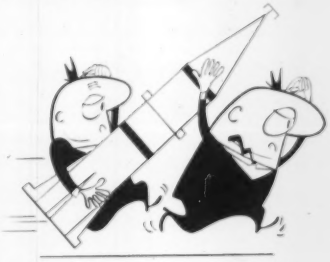
This law shall apply to authorized strikes, unauthorized (wildcat) strikes, and to sit-down strikes. Such a law would wipe out seniority, and all privileges that are based on length of service.

I have been told that it would penalize the worker. However, the present situation penalizes the man with a fixed income.

How can we make Congress pass such a law? Letters to members of Congress and letters to associations such as the National Association of Manufacturers will turn thoughts in the right direction.

W. Trinks
R.D. 1
Ohiopyle, Pa.

Contracting of Missiles



In the Metalworking Outlook of Aug. 5 (Page 49), an item headline reads "Shift to Missiles Helps IT&T," and you report that the International Telephone & Telegraph Co. is heavily involved in missile work.

But, in your Oct. 7 issue, you do not mention this company in the Missile Scoreboard chart included in the story, "Missiles in Quantity Soon?" (Page 119).

Which article is correct, please?

Allen E. Watt
132 Palos Verdes Blvd.
Redondo Beach, Calif.

• *Both articles are correct. The Missile Scoreboard showed only prime contractors. IT&T is not a prime or major systems contractor. Its work comes through subcontracts, as is the case with*

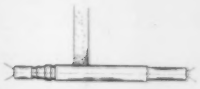
(Please turn to Page 12)

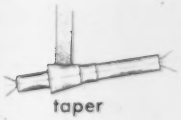
Versatility and quicker setups cut grinding costs for toolrooms and short run production

Landis 10" x 20" and 10" x 24" Universal Cylindrical Grinders feature Microsphere Wheel Spindle Bearings for maximum accuracy, high finishes and dependable operation.

LANDIS
precision grinders
LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

Grinding jobs which can be done on this machine


traverse and infeed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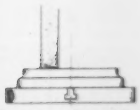
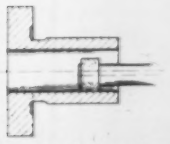
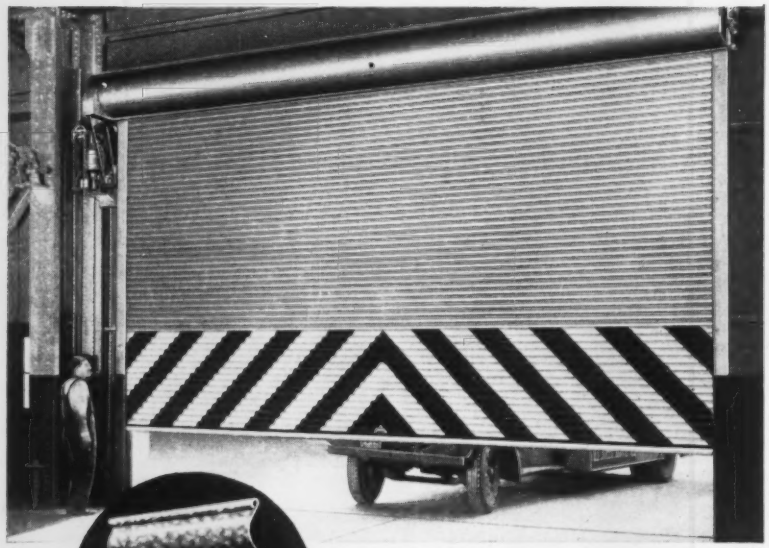
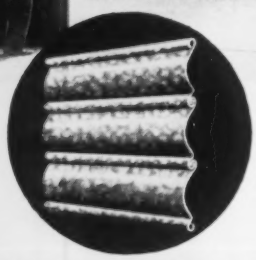

face and angle


internal—straight and angle

Longer lasting...

Kinnear
Steel Rolling Doors





HEAVILY GALVANIZED
For Lifetime Door Service

As the Sphinx and the pyramids are symbols of long life among the structural wonders of all time, so do Kinnear Rolling Doors represent the utmost in "Lifetime Door Efficiency".

The rugged strength of the interlocking steel slat curtain, *originated by Kinnear*, is one reason. Another is its coiling upward action — it opens out of reach of damage by wind or vehicles.

Equally important is Kinnear's thorough, heavy, high grade galvanizing. It adds a full 1.25 ounces of *pure zinc* to every square foot of metal, (ASTM standards). This galvanizing is followed by Kinnear's own *test-proved, time-proved* Paint Bond treatment, which assures quick, thorough, *lasting* coverage and adhesion of paint applied after the doors are erected.

These Kinnear "life-extension" features give you *more years* of smooth, space-saving, time-saving door efficiency—*more years* of extra all-metal protection against fire, wind, weather, vandalism and intrusion. Kinnear Rolling Doors are built to fit openings of any size, with manual or motor operation to meet any need. Write for details.

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Offices and Agents in All Principal Cities

KINNEAR
ROLLING DOORS
Saving Ways in Doorways

LETTERS

(Concluded from Page 10)

hundreds of U. S. firms working on the missiles programs.

IT&T's interest in missiles is important. Its four main defense industries currently count Air Force contracts as 40, 61, 16, and 39 per cents of their 1957 sales results. Two of their divisions will get 100 per cent of their 1957 sales from defense contracts in general.

Article to Field People

We feel your article, "Brazing Alloy Selector" (Oct. 7, Page 162), is well done. We would like 25 reprints to distribute to our field people, since articles such as this make excellent reference material.

W. T. SanSouci
Manager
Brazing Product Sales
United Wire & Supply Corp.
Providence, R. I.

Down-to-Earth Presentation

Please send a few copies of your article, "Suppliers' Outlook Mixed" (Sept. 9, Page 63). We found it quite interesting and compliment you on a down-to-earth presentation.

L. J. Hardke
Purchasing Agent
Whirlpool-Seeger Corp.
St. Joseph, Mich.

Values Chip Form Pictures

Please send 12 copies of the article, "How To Get More from Machine Tools" (Sept. 23 insert). We feel this article with its photographic display of chip forms will be of great value. We wish to distribute copies to our methods and time study personnel, machine shop foremen, and lead men.

Melvin Spicer
Methods & Standards
Chain Belt Co.
Los Angeles

Article to Management

Your Program for Management article, "Dealing with Workers" (Sept. 16, Page 119), is of extreme interest to me. I would appreciate receiving several copies to present to management.

J. J. Valentine
Director of Research
Mercast Mfg. Corp.
LaVerne, Calif.

Request from Argentina

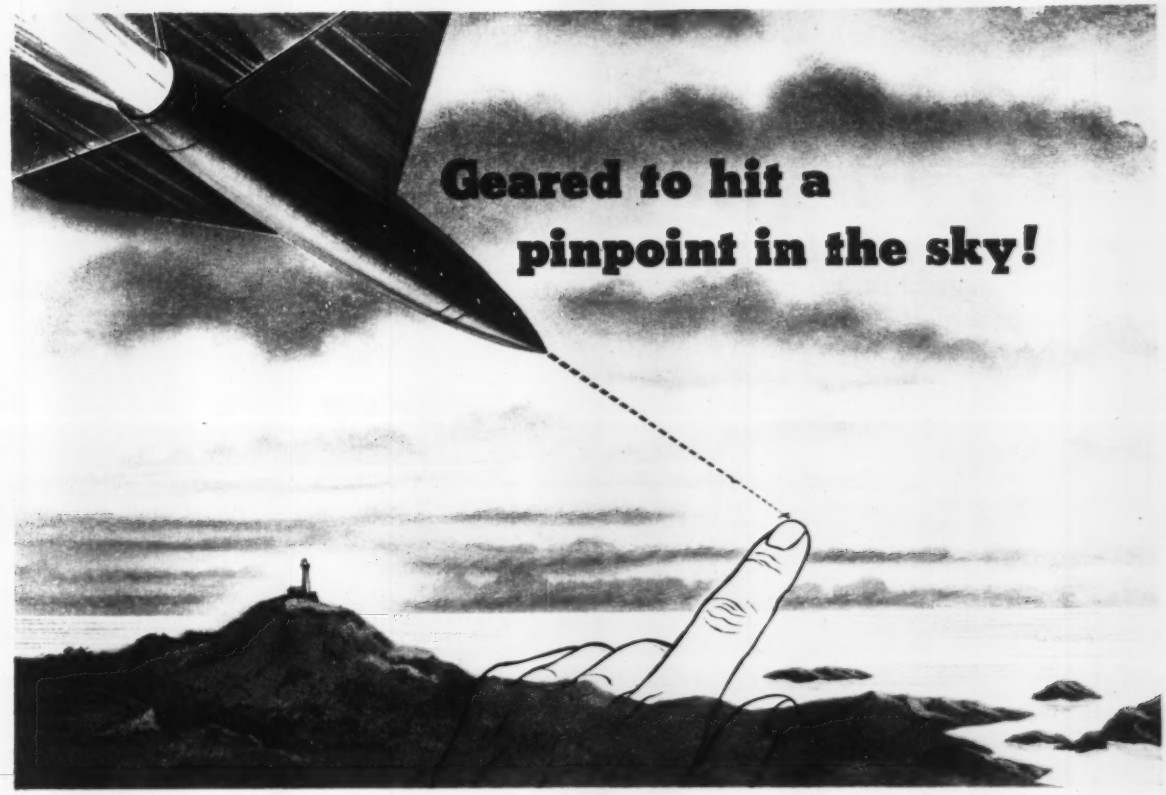
We have found the article, "New Ways To Fight Corrosion" Part I (Aug. 26, Page 68) interesting. We would appreciate a reprint of it as well as one of Part II (Sept. 2, Page 158) which discusses organic and metallic coatings.

Harry A. Allevin S.R.L.
Import-Export Representatives
Buenos Aires, Argentina

Research in Business

May I have a reprint of the article, "Research . . . Threshold to the Future" (July 15, Page 93). As a teacher of marketing research, I am interested in the role of research in business. Your article will be helpful to me and of interest to my students.

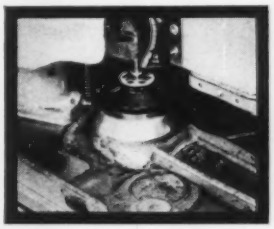
H. C. Barksdale
Associate Professor of Marketing
School of Commerce, Accounts, & Finance
New York University
New York



Research and development are constantly extending the range and speed of modern military aircraft and missiles, making higher and higher demands on counter-measures as well.

In designing counter-measure controls to the high degree of accuracy required for our air defense, engineers are specifying gears of greater and greater precision and gear trains whose combined errors are almost infinitesimal. In many plants, gears which meet these specifications are being turned out on *standard* Fellows equipment at a high rate of production.*

To combine extreme accuracy with high production rates, look to the complete Precision Line of Fellows gear production equipment. Fellows Gear Shapers are available in a full range of capacities from 1/16" to 120" P. D. Write, wire, or phone any Fellows office.



*For example, Hughes Aircraft makes up to 15,000 fine pitch gears per month with tooth-to-tooth composite error as small as 0.0003"...on standard Fellows equipment.

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THE PRECISION LINE

Fellows *Gear Production Equipment*

Duquesne Light Company uses to bring more electricity

NATIONAL Seamless being lowered through house service lines into trench. Continuous sections between manholes sometimes reached lengths of 1900 feet.

NATIONAL Seamless Pipe being welded into continuous lengths between manholes. Welds were tested at 500 psi—2½ times nominal operating pressure. Flush inner surfaces of welds were assured by pre-flaring the pipe ends and then using a steel backing or chill ring to prevent the formation of welding icicles.

WALLS WITHOUT WELDS

high-pressure pipe-type cable to Pittsburgh

PREPARING to weld pipe for pulling across Ohio River. Pipe for the river crossings has heavier wall, to provide additional margin for burning in case of a line to ground fault in a river section. A 1-inch coating of concrete overall provides negative buoyancy of at least 10 pounds per foot to prevent flotation during installation.

DUE TO THE EXTENSIVE building program and increased use of air conditioning in downtown Pittsburgh in recent years, Duquesne Light Company found it necessary to expand its electrical facilities in that area. This was accomplished by installing a new substation in the downtown district, and supplying it by two 69 KV feeders from two existing power sources.

The transmission system chosen to handle 100,000 KVA at 69 KV was a high-pressure oil pipe-type cable. Basically, this system consists of seamless steel pipe, joined by welding, functioning as conduit into which is drawn three solid-type paper-insulated oil-impregnated cables. The remaining space within the pipe is filled with high-grade insulating oil which is kept at a nominal operating pressure of 200 psi by automatic pumping facilities. This external pressure on the cable keeps the cable dielectric subject to saturation by insulating oil under all operating conditions so that the formation of voids within the dielectric is virtually eliminated. The pipe-type cable system has a lower failure rate than any other high-voltage cable system in use today.

USS National Seamless Pipe, 8⅝" O.D., was the conduit used throughout this installation. The exterior was coated with an asphaltic base material for protection against electrolysis and forms of corrosion. After pipe sections were laid, the pipe was put through a rigid evacuation and drying procedure—one of the most critical phases of the job, since moisture in the pipe may lead to displacement of oil in pockets of low points and eventual cable failure.

Critical installations like this call for exceptionally strong, flexible pipe to resist severe internal and external stresses; uniform, dependable pipe that, once installed, will give long, trouble-free service. National Seamless Pipe is chosen consistently because it fits the specifications of every job so well.

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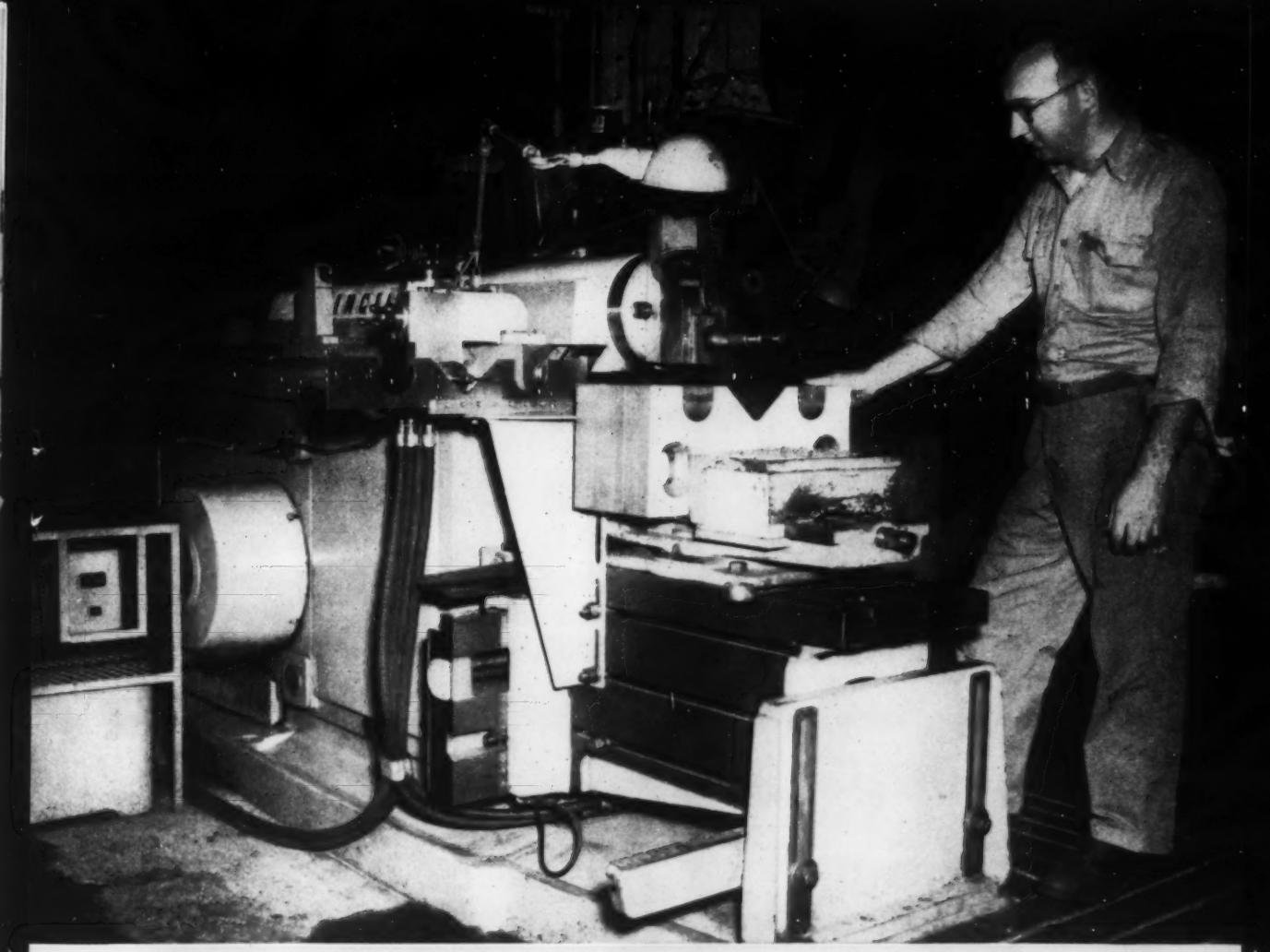

Photograph courtesy of Heppenstall Company, Pittsburgh 1, Pa.

High-alloy shear knives machined on accurate Cincinnati Rigid Shaper...

at HEPPENSTALL COMPANY, Pittsburgh 1, Pa.

This Cincinnati 36" Rigid Shaper, equipped with an automatic contouring unit, is machining high-alloy steel shear knives. These knives will be used to cut 3" round-cornered squared billets and 2½" rounds, by a leading Midwestern drop-forge company.

The heavily ribbed column, extended ram bearing and slot-free ram insure minimum deflection and maximum accuracy. Exclusive Cincinnati 50 psi pressure lubrication is real insurance against wear. The Cincinnati electro-magnetic brake and clutch with finger tip control is positive and trouble free. Faster on the job . . . Easier on the operator.

Write Department C for Bulletin "Cincinnati Rigid Shapers". We also suggest you consult our Application Engineering Department regarding your machining problems.

THE CINCINNATI SHAPER CO.

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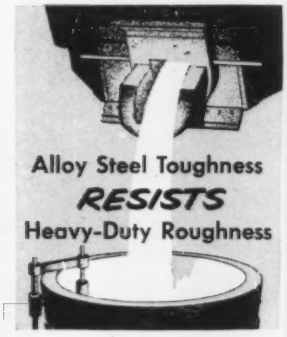


DRIVE AXLE

Model "660" Motor Grader is built by Adams Division, LeTourneau-Westinghouse Company, Indianapolis, Ind.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

DESIGNED FROM ALLOY STEEL

Shrugs Off Fatigue, Terrific Torque, High Impact Load

Motor graders built by Adams Division of LeTourneau-Westinghouse Company are known throughout the world for quality and dependability.

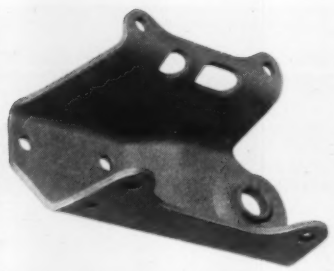
A good example of the company's constant effort to improve this quality and dependability can be found in the grader's full-floating, two-section drive axle—considered to be the most vulnerable part in the entire unit. It is subjected to terrific torque from an eight-speed, constant-mesh transmission. Impact load is often extreme.

Company engineers and metallurgists spent thousands of hours on research and field testing of all types of steels to find one that would reduce ultimate fatigue in the axle to an absolute minimum.

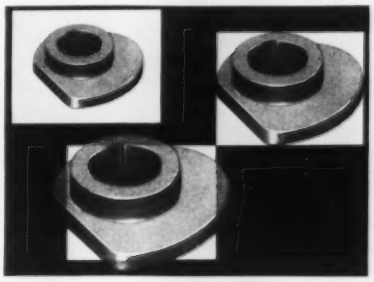
They eventually settled on Republic Hot Rolled 4340 Alloy Steel. This fine steel not only resists fatigue, but also is able to take a high torque without a permanent set. Fatigue failure is now practically non-existent.

Alloy steels provide an outstanding combination of qualities essential to designing smaller sections to move or carry heavier loads with no sacrifice of strength or safety. They resist fatigue, shock and stress. Respond uniformly to heat treatment, producing hard, wear-resistant surfaces around tough cores. This tough, integral structure provides greater strength with minimum weight.

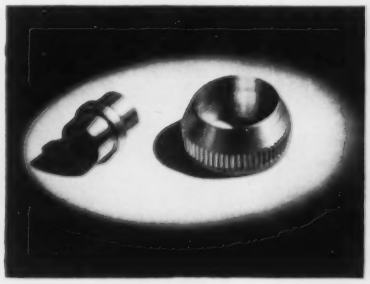
Specify Republic Alloy Steels for your jobs where strength and toughness must resist heavy-duty roughness. We offer you the services of our experienced field metallurgists to help you get the most from these versatile steels at the lowest possible cost. There's no obligation. Just mail the coupon.



COMPLETE DESIGN, engineering and fabricating facilities go to work for you as an extension of your plant when you have your stamped and drawn parts fabricated by Republic's Pressed Steel Division. This truck shaft bracket is one example of a wide variety of steel parts mass produced to specification at the lowest possible cost. Send coupon for Booklet Adv. 681.



DIE AND PART DESIGN PROBLEMS are reduced by 3 new grades of Republic Iron Powder with *Controlled Dimensional Factor.* In the presence of copper, these powders—depending on type—can be made to grow, remain stable, or shrink, within acceptable limits. Complete information on Type "G" for growth, Type "N" for normal, Type "S" for shrinkage are contained in Booklet Adv. 763. Write for it.



DESIGN FLEXIBILITY PLUS HIGH STRENGTH are secured by Flodar, Inc., Cleveland, Ohio, through use of Republic Cold Drawn Leaded Alloy Steel for these hydraulic fitting parts. Compared with non-leaded alloy, machining speeds were increased 200%, with negligible scrap loss. Also, a fine finish and excellent tool life are secured, plus the strength needed to withstand high-compression loads. Send coupon for facts.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. C-2829A
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Send more information on:
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☐ Cold Finished Leaded Steel Bars

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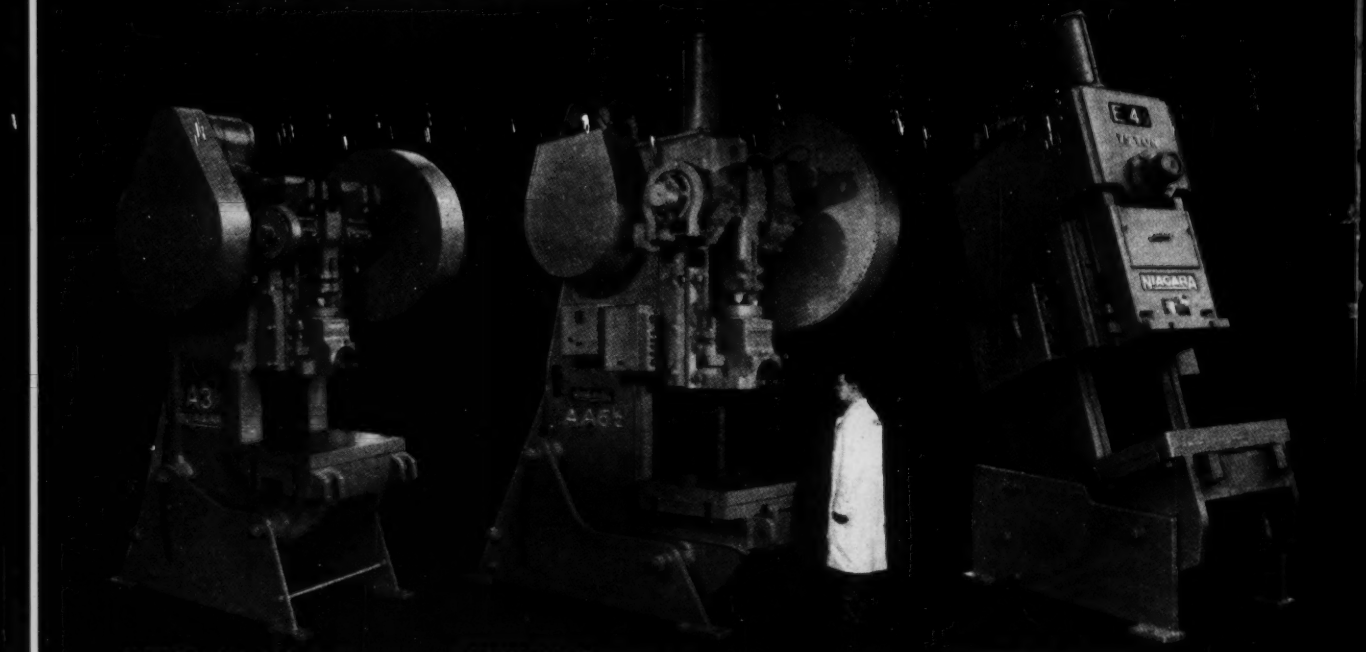
NIAGARA HAS THEM!



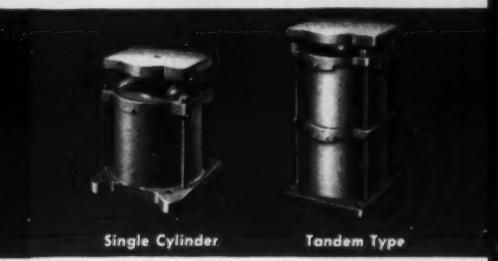
SERIES A, 5½-110 tons

SERIES AA, 32-200 tons

SERIES E, 75-200 tons
Front-to-Back Crankshaft

READILY EQUIPPED TO HANDLE

14 pt. Mechanical Sleeve | 18 pt. Electro-Pneumatic Sleeve | Electro-Pneumatic Friction



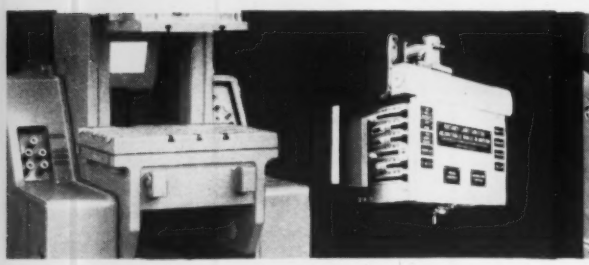
Single Cylinder | Tandem Type

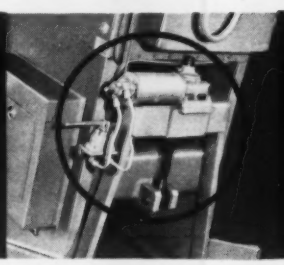
THREE TYPES OF CLUTCHES

Each Niagara Inclinable features the clutch best suited for the purpose. (1) Famed Niagara multi-jaw mechanical sleeve clutch. (2) Exclusive Niagara multi-jaw Electro-Pneumatic sleeve clutch. (3) Niagara low inertia Electro-Pneumatic friction clutch.

FOUR TYPES OF DIE CUSHIONS

Designed and manufactured by Niagara, single cylinder and tandem type pneumatic die cushions are built in 4 types to make any Niagara Inclinable a double action press. Self-lubricating models are available for automated OBI's.





SPECIAL BOLSTER PLATES

J.I.C. CONTROLS FLANGED SLIDES

POWER SLIDE ADJUSTMENT

FLYWHEEL BRAKE

DIE AREA LIGHTING

MOTOR CUTOUT SWITCH

EQUIPPED FOR AUTOMATION

Featuring the most advanced controls and devices, Series EA (automated models) are engineered for peak productive capacity. Here's a line of OBI's that is completely equipped by Niagara for operation in your automation lines.

POWER INCLINING DEVICE

Fast-acting, safe and easy to operate, Niagara's air motor inclining device (shown above) is furnished as an optional accessory.

WIDE CHOICE OF ACCESSORIES

With a full selection of modern press accessories available, Niagara Standard Inclinables are adaptable to the widest possible range of job assignments.

standard OBI presses in all sizes and types that are right for you!

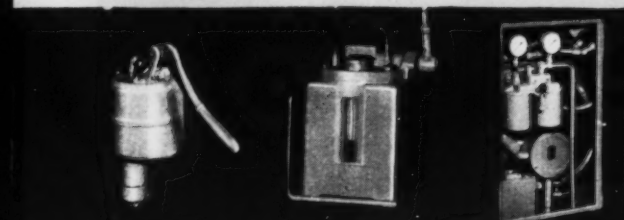
SERIES EA (Automated), 75-200 tons
Front-to-Back Crankshaft

SERIES BI, 60-200 tons
Double Crank

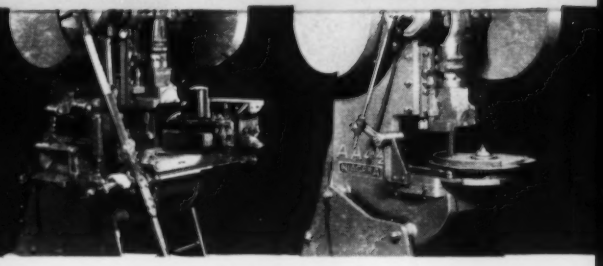
5 LINES . . . 34 MODELS
EACH A CHAMPION IN ITS CLASS:

Niagara offers you industry's most complete, most modern, and *most exclusive* selection of standard inclinables . . . *plus* an unequaled choice of press accessories and automatic devices to meet your specific job requirements. You can count on Niagara for inclinables that will do the most to speed production, assure accuracy, prolong die life and hold down maintenance costs within your plant.

YOUR WORK MOST PROFITABLY



Manual Automatic Automatic Circulating



CENTRALIZED LUBRICATION TO FIT THE NEED

Niagara Inclinables are readily equipped with either manually-operated or automatic lubricators, or automatic circulating oil systems. It's one of the many ways in which Niagara outfits standard inclinables to meet individualized requirements.

ALL TYPES OF AUTOMATIC FEEDS

To speed production, Niagara Inclinables are easily equipped with complete, automatic feed arrangements: single roll, double roll, dial, chute, magazine and specially engineered types. Variable speed drives can be provided to allow adjustment for the optimum speed consistent with the die, material and feed length.

NIAGARA

America's most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work.

GET ALL OF THE FACTS on any or all Niagara Inclinable Presses. Consult with a Niagara representative. His recommendation will be impartial. He has all types of OBI's to offer. At your request, specific Bulletins on each series, containing complete information and specifications, will be mailed to you promptly

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

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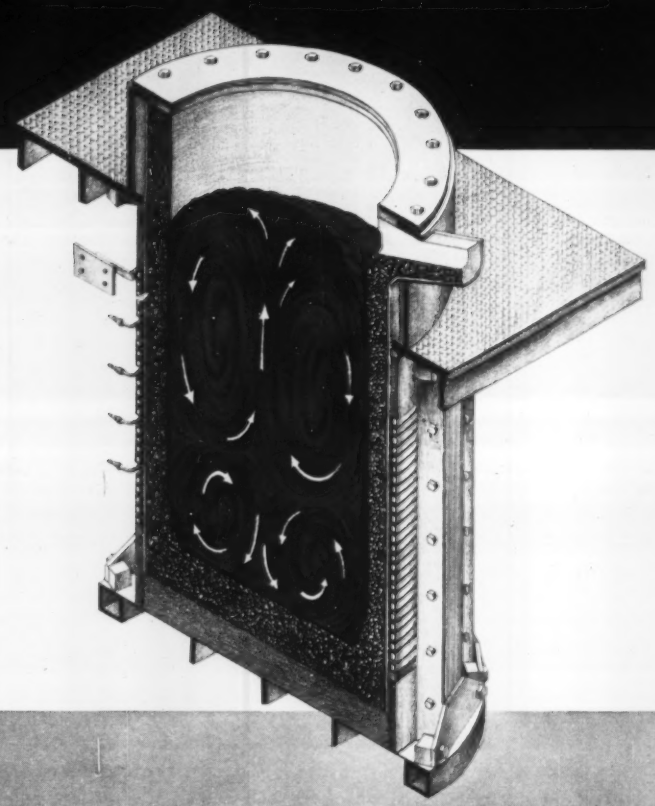
See it at the Show*

AJAX-JUNKER



CORELESS 60 CYCLE INDUCTION MELTING FURNACE

*The Metal Show
International
Amphitheatre
Chicago, Ill., Nov. 4-8
Booth No. 1406

IF YOU ARE UNABLE TO ATTEND THE SHOW SEND FOR BULLETIN R-52

A cylindrical induction coil supplied with ordinary 60 cycle current induces heat and vigorous electromagnetic stirring in the molten metal charge. Integrated electric controls regulate power, maintain high power factor automatically. Monolithic refractory linings are made by ramming against the sturdy water-cooled coil held in a rigid frame of magnetic and structural steel.

This new principle was perfected in Europe over the last seven years. Over 100 Junker furnaces are now in use. AJAX-JUNKER designs are based on latest experience, using American components and practices throughout.

Outstanding results are proven in these fields:

DUCTILE AND ALLOY IRON CASTINGS
RECOVERY OF IRON TURNINGS
RECOVERY OF ALUMINUM SCRAP

Available sizes range from 1 to 10 tons, with normal melting cycles from 2 to 4 hours. Power ratings are 200 kw through 1500 kw.

AJAX USA

60 CYCLE INDUCTION MELTING

ENGINEERING CORPORATION

TRENTON 7, NEW JERSEY

Associated Companies: Ajax Electrothermic Corporation Ajax Electric Company

CALENDAR
OF MEETINGS

Oct. 28-31, Atomic Industrial Forum and American Nuclear Society: Annual meetings and 1957 Trade Fair of the Atomic Industry. Plaza Hotel and New York Coliseum, New York. Information: Atomic Industrial Forum, 3 E. 54th St., New York 22, N. Y. Executive manager: Charles Robbins.

Oct. 28-31, National Industrial Packaging & Handling Exposition: Convention Hall, Atlantic City, N. J. Information: Hanson & Shea Inc., One Gateway Center, Pittsburgh 22, Pa.

Oct. 29-31, Truck Body & Equipment Association: Annual convention and exhibit, Sherman Hotel, Chicago. Association's address: 401-402 Washington Board of Trade Bldg., Washington 6, D. C. Executive manager: Arthur H. Nuesse.

Oct. 30-Nov. 1, National Association of Aluminum Distributors: Annual meeting, Camel Back Inn, Phoenix, Ariz. Association's address: 1900 Arch St., Philadelphia 3, Pa. Secretary: R. Bruce Wall.

Oct. 31-Nov.1, American Zinc Institute Inc.: Meeting of the galvanizers committee of the steel industry, Pick-Ohio Hotel, Youngstown. Institute's address: 60 E. 42nd St., New York 17, N. Y. Secretary-treasurer: J. L. Kimberley.

Oct. 31-Nov. 2, National Metal Trades Association: Annual convention, Conrad Hilton Hotel, Chicago. Association's address: 337 W. Madison St., Chicago 6, Ill. Secretary: Charles L. Blatchford.

Oct. 31-Nov. 3, National Tool & Die Manufacturers Association: Annual meeting, Edgewater Beach Hotel, Chicago. Association's address: 907 Public Square Bldg., Cleveland 13, Ohio. Executive secretary: George S. Eaton.

Nov. 1-3, Metal Treating Institute: Annual meeting, Sheraton Hotel, Chicago. Institute's address: 271 North Ave., New Rochelle, N. Y. Executive secretary: C. E. Herrington.

Nov. 2-8, American Society for Metals: Annual meeting, Palmer House, Chicago. Society's address: 7301 Euclid Ave., Cleveland 3, Ohio. Managing director: William H. Eisenman.

Nov. 2-8, National Metal Exposition and Congress and World Metallurgical Congress: International Amphitheatre, Chicago. Information: American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. Managing director: William H. Eisenman.

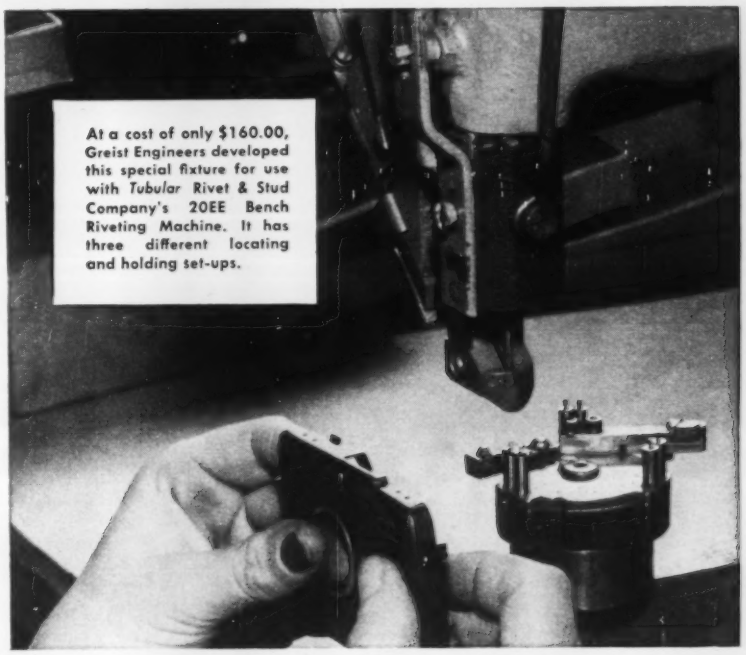
Nov. 3-8, Society for Nondestructive Testing: Annual meeting and international conference on nondestructive testing, Hotel Morrison, Chicago. Society's address: 1109 Hinman Ave., Evanston, Ill. Secretary: Philip D. Johnson.

Nov. 4-5, Wire Reinforcement Institute Inc.: Annual fall meeting, Safari Hotel, Scottsdale, Ariz. Institute's address: National Press Bldg., Washington 4, D. C. Managing director: Frank B. Brown.

Nov. 4-6, American Institute of Electrical Engineers: Machine tool conference, Hotel Schroeder, Milwaukee. Institute's address: 33 W. 39th St., New York 18, N. Y. Secretary: N. S. Hibshman.

Nov. 4-6, American Institute of Mining, Metallurgical & Petroleum Engineers: Institute of Metals Division meeting, Morrison Hotel, Chicago. Institute's address: 29 W. 39th St., New York 18, N. Y. Secretary: E. O. Kirkendall.

MAKE ASSEMBLY PAY PROFITS


At a cost of only $160.00, Greist Engineers developed this special fixture for use with Tubular Rivet & Stud Company's 20EE Bench Riveting Machine. It has three different locating and holding set-ups.

Tubular's RIVETERS HELP GREIST*

Versatility Plus Ingenuity

Greist uses *Tubular's* Rivets and Riveting Machines because their versatility is limited only by the ingenuity of the user. In this particular application, the special fixture eliminates two machines and permits one operator with one machine to do the work of three. By simply positioning the work in the fixture and pressing two trip buttons, the riveting head automatically engages, feeds and fastens the assembly in two places. The obvious savings helped Greist pay off their modern $3 million plant in three years.

*GREIST of New Haven

The Greist Manufacturing Company not only makes the world's finest sewing machine attachments but has specialized in metal stamping and assembly since 1871. Some of the best light assemblies in America are produced by Greist.

TUBULAR of Quincy

If profits are important in your assemblies and riveting is your method of fastening, now is the time to investigate *Tubular's* Rivets, and *Tubular's* Automatic Riveting Machines. They can feed and set as many as 12 different rivets on different planes in one operation at the same time. Send us a drawing or work sample today.

SEE US AT NATIONAL METAL SHOW · CHICAGO · BOOTH 1779

Tubular Rivet & STUD COMPANY
WOLLASTON (QUINCY) 70, MASS.

FASTEN AUTOMATICALLY BETTER and FASTER with TUBULAR'S RIVETS and MACHINES

MIDWEST OFFICE & WAREHOUSE—CHICAGO

BRANCH OFFICES: ATLANTA • BUFFALO • CHARLOTTE • DALLAS • DETROIT INDIANAPOLIS • LOS ANGELES • NEW YORK CITY • PHILADELPHIA • ST. LOUIS SAN FRANCISCO • SEATTLE

See your local classified directory for phone numbers

How Aluminum helps "Porky" flavor the ham you eat!

"Porky" supplies the meat . . : curing preserves it and provides the distinctive flavor you enjoy. Best curing results are attained when brine is pumped at constant uniform pressure. This assures an even distribution of flavor and color, and adds to the over-all excellence of the meat.

Brine pressure for this curing process is maintained via two aluminum impellers, coated with neoprene, that oscillate at 3500 strokes per minute to generate the necessary flow. Aluminum is a must – because of its light weight, strength and superior machinability. It bonds well with neoprene. *And*, it is *always quickly available* from Frasse.

Frasse stocks aluminum in practically every form . . . in a wide variety of grades and tempers – and size ranges are unusually complete. So, standardize on Frasse as your *single* source for aluminum – you'll find it a time and effort saving convenience.

Courtesy: Eco Engineering Co.

Call FRASSE 1st for ALUMINUM

Screw Machine Stock
Rounds • Squares • Hexagons
Rectangles • Angles
Channels • Sheets • Plates
Tubing • Pipe
Fittings • Extrusions
Tool and Jig Plate

Peter A. Frasse & Co., Inc.

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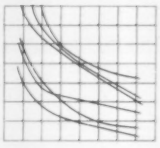
LYNDHURST, N. J. • ROCHESTER, N. Y. • BALTIMORE, MD.

It isn't easy . . . the job of knowing exactly the right way to apply heat in the making of your product. That's what we're here for, to give you the right answers. Stay with us for five minutes and four pages and we'll give you an idea how Lindberg's answers can ease your job.

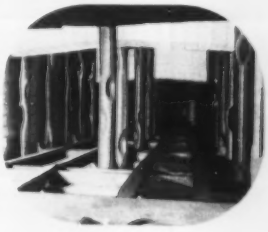
Applying heat to industry has been Lindberg's business for many years. But the way we've gone about our business is what's most important to you. First of all, Lindberg covers all phases of "heat for industry" in a much broader way than anyone we know in the field. So we can recommend just the right equipment, the correct techniques best suited to your individual requirements and your production methods. It's pretty significant, too, that over the years Lindberg has come up with many of the most vital improvements in the industry, frequently as an answer to customer needs for faster, more efficient, more economical methods.

We've kept ahead of the field because here at Lindberg we have been able to put together an exceptional creative staff of metallurgists, research technicians and engineers, the best in the business, we vow. Also, through our world-wide organization, with plants and subsidiary companies in many countries, we are always abreast of the latest industrial developments anywhere.

Here are a few examples of Lindberg innovations. Years ago Lindberg engineers pioneered and developed the famous Cyclone furnace, applying the first 100% forced convection heating principle for accurate, low cost tempering. This was followed by the introduction of the world's first high temperature (2200° F.) endothermic generator and the raising of 100% high speed convection heating into the high temperature field.



Modern heat treating methods owe much to Lindberg, what with the development of controlled atmosphere generators, the creation of dew point equilibrium curves to establish proper atmosphere values for type of steel and temperatures involved and the exclusive Lindberg Carbotrol to maintain these values automatically. For fuel-fired atmosphere furnaces we also perfected the "dimple" vertical radiant tube, a big step toward better furnace design. Provides more efficient heat application in more compact, less space-consuming furnaces. Portable, replaceable in a few minutes, this tube operates at maximum efficiency longer.



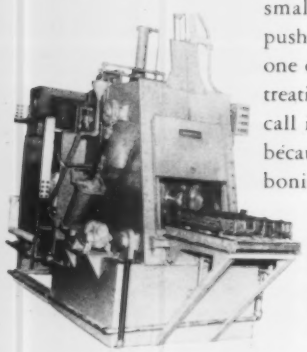
Lindberg Engineering Company

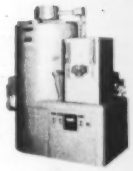
2450 WEST HUBBARD STREET • CHICAGO 12

Scratch a new industrial heating idea and you'll find "Lindberg" every time. Our research and development engineers and technicians won't have it any other way. That's why they consistently come up with newer and better ways of making heat work for you in your industry, bless 'em.

You've probably heard a lot about Lindberg's wonderful new CORRTHERM electric heating element lately. It's quite a thing! It makes carbonitriding and carburizing with electricity practical, efficient and economical. CORRTHERM elements operate at extremely low voltage, eliminating leakage through carbon saturation, previously such a problem in electric atmosphere furnaces. With superlative heating units for either electric or fuel-fired furnaces you can be sure that Lindberg need play no favorite when recommending the equipment most practical, most efficient and most economical for your job.

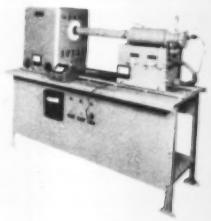
Our name is synonymous with carbonitriding and carburizing furnaces. We've built thousands of them, from small jobs up to big three-row pusher automatics. At the left is one of the most widely used heat treating furnaces in the world. We call it Lindberg's "Five-in-one" because it's ideal for five jobs, carbonitriding, carburizing, annealing, hardening and carbon restoration. Our Heat Treating Furnace Division has the experience, the knowledge and the courage to engineer and build furnaces to meet the precision requirements of any heat treating operation. We build them for carbonitriding, carburizing, hardening, tempering, normalizing, bright stainless annealing, brazing, carbon correction, nitriding, sintering, or what need you. Atmosphere generators, too, all types of them to take care of any heat treating operation requiring a protective atmosphere.





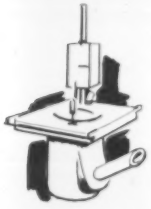
For research use Lindberg makes a broad line of heating equipment scientifically designed for maximum control and dependable operation, everything from simple hot plates to small heat treating furnaces actually usable for minor production jobs. An unusual Lindberg development for laboratory use is a High Frequency unit for carbon and sulfur determination.

New at Lindberg is a line of larger-than-lab, smaller-than-standard equipment designed specifically for pilot plant use. You can test your materials, your methods, on equipment moderately priced but production capable. Fuel-fired, electric and High Frequency units are included. At the right is an electric vacuum-type furnace ideal for testing this newest and most promising heat treating method. For complete details write our Pilot Plant Equipment Division.

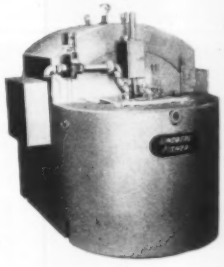


From a laboratory furnace no bigger than a breadbox to a car bottom furnace as big as a six-room house, there's no limit to what Lindberg can make heat do for you. Whatever product you make, if heat will make it better, there's a Lindberg furnace that's sure to do the job better.

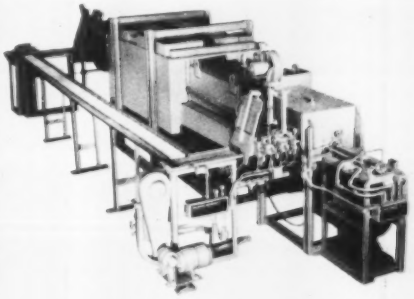
Heat and aluminum have been Lindberg's twin babies for years. Our research and engineering staff has made a lot of innovations in this field, too, starting with the now famous two-chamber induction melting furnace introduced more than ten years ago. Most recent development is the Autoladle (we call it "Little Joe"), the first practical automatic aluminum ladling unit yet devised. Used with Lindberg melting and holding furnaces "Little Joe" makes automatic casting of aluminum fast, dependable and economical.



Lindberg's Melting Furnace Division makes a wide variety of melting and holding furnaces for aluminum, brass, bronze, tin, zinc, lead and other non-ferrous metals. These include aluminum reverbs, nose-pouring crucibles, electric resistance holding furnaces (illustrated at the right complete with "Little Joe" automatic ladling pump). For foundry, permanent mold or die-casting plant, independent or captive, there are Lindberg melting and holding furnaces to fit your requirements. If your problem in this field needs a special solution Lindberg's design staff can find it.



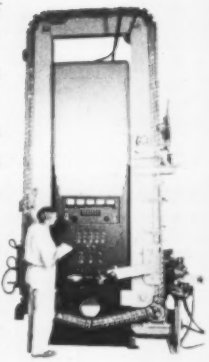
Suppose your industrial heating operation has to do with ceramics. We also offer you superior equipment for every ceramic application. Lindberg's long experience in applying heat and atmospheres to metals has been a natural background for the development of ceramic kilns for all purposes. Our Ceramic Kiln Division provides all types of kilns, big ones, small ones, electric or fuel-fired, standard or special, for electrical ceramics, abrasives, refractories, ferrites, sintering and



calcining, structural clay products and white ware. Shown above is an entirely new type of kiln, developed for the special requirements of electrical ceramics. It is completely automatic, atmosphere controlled with five zones of control for flexibility. In ceramics, too, our designers and engineers welcome the opportunity to develop special equipment to fit your special product requirement.

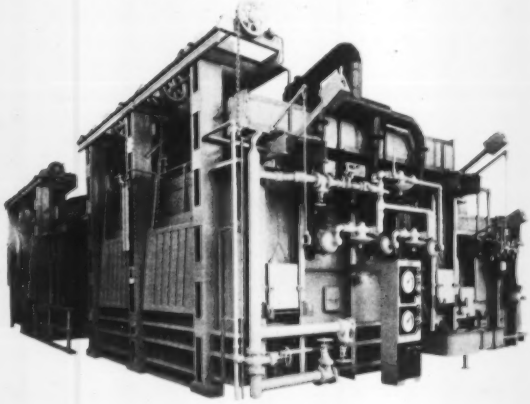
heat for industry

Bring all your questions to Lindberg at the Metal Show in Chicago. It's 9 to 1 our eggheads can answer them. Just look for "Lindberg" and "Booth 620". You'll find all the smiling faces there . . . in the low-pressure area. A cordial invitation, too, to visit our Chicago plant.



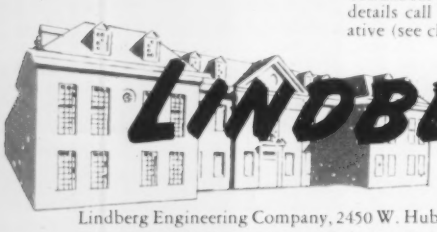
To round out the full measure of its service to "heat for industry" Lindberg is one of the largest makers of High Frequency heating units. Our "H-F" designers and engineers have made outstanding developments in this important heat treating field. For example, at the right is a remarkable unit just recently completed for aluminizing automotive valves. It was designed vertically, saving 60% of floor space, and is completely automatic. No operator is required. It fits perfectly into an automated production line.

Lindberg also specializes in field installation. We call this part of our business Lindberg Industrial. Whether your requirements call for the installation of a big one like the aluminum reverberatory furnace shown below or a complete heat treating department of smaller units, Lindberg will handle the job all the way. We specialize in "turn-key" installations, covering everything from design and engineering to the finished job. This includes all the construction needed to fit the equipment into your production processes.



Our High Frequency Division provides units for hardening, brazing, soldering, annealing and many other processes and designs a variety of fixtures for application to "H-F" units. Lindberg also supplies a complete line of motor generators for all induction heating and melting applications. This equipment is available for M-G set frequencies of 1 KC., 3 KC. and 10 KC. and in power outputs from 30 KW. to 1250 KW.

Thanks for your attention to this brief story. For full details call your nearest Lindberg Field Representative (see classified phone book) or write us direct.



LINDBERG heat for industry

Lindberg Engineering Company, 2450 W. Hubbard St., Lindberg Industrial Corporation, 2321 W. Hubbard St., Chicago • Los Angeles plant, 11937 S. Regentview at Downey, California • EFCO-Lindberg, Ltd., Montreal, Canada • Lindberg Italiana, Milan, Italy The Electric Furnace Company, Ltd., Weybridge, Surrey, England • Etablissements Jean Aubé, Paris, France • Lindberg Industrie Ofenbau, Gross Auheim, Germany • Toyo Menka, Tokyo • Lindberg Engineering Company (Australia) Pty. Ltd., Melbourne

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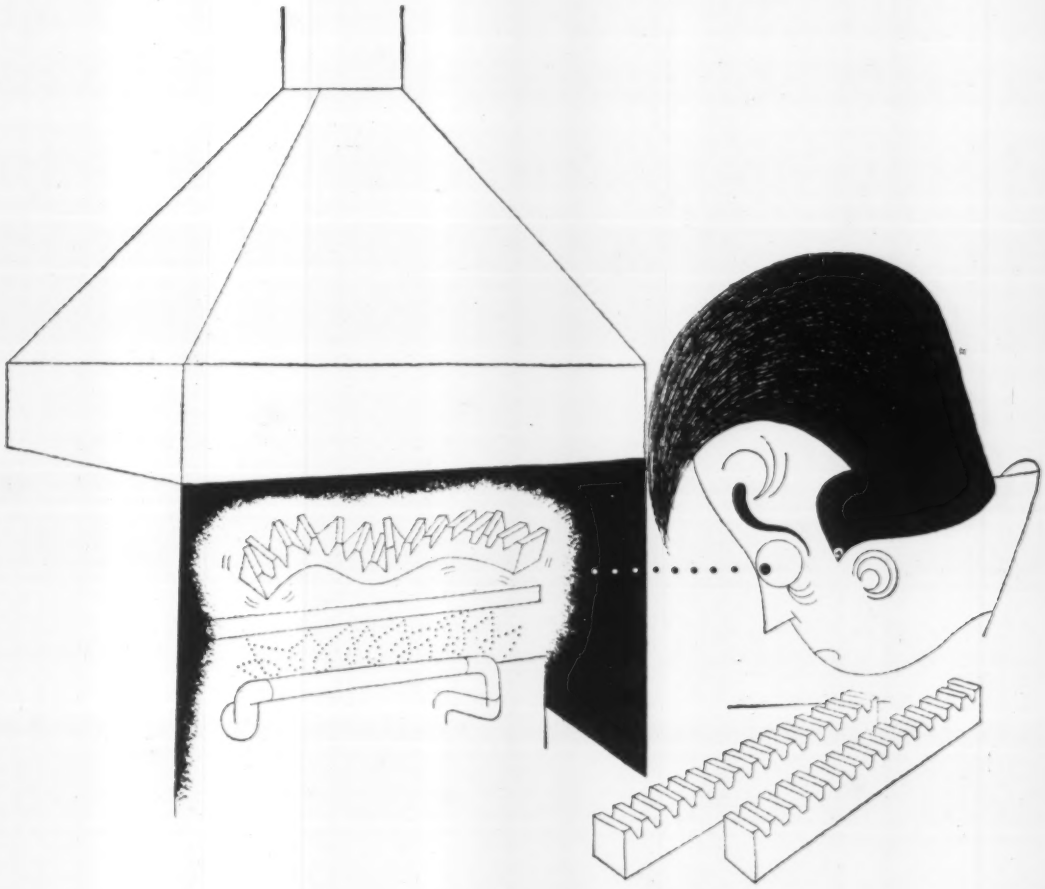


Distortion a problem?

Then switch to nondeforming **MAX-EL 3½** alloy steel. It's a general purpose grade that can't be beat for most jobs. And it's quickly available from local Crucible warehouses.

MAX-EL® 3½ is a high quality, free machining alloy steel that gives high strength with toughness and hardness. Yet it's well known for its ease of machining and deep hardening characteristics. In many cases there's a cost advantage in machining parts directly from MAX-EL bars which have been heat treated and stress relieved at the mill. *This eliminates heat treating after machining, and insures minimum distortion.*

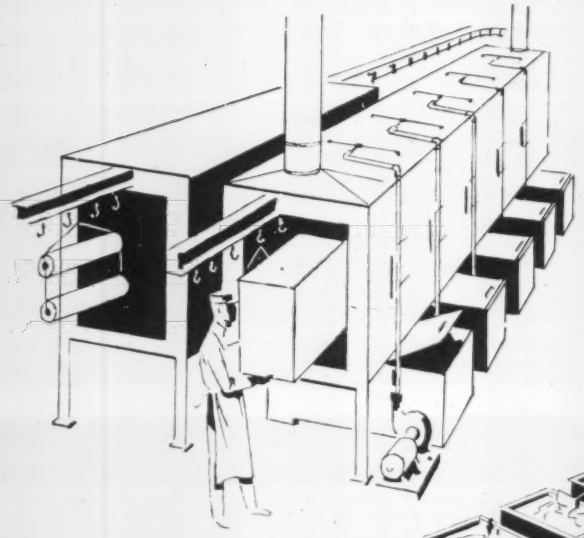
MAX-EL 3½ is one of hundreds of special steels regularly stocked at all local Crucible warehouses. And Crucible warehouse service offers you unlimited help with steel problems, when you want it. For Crucible is the only specialty steel producer *fully integrated to the point of use.* That means control and responsibility from raw materials to warehouse delivery to you.

STOCKS MAINTAINED OF:
Rex High Speed Steel . . . ALL grades of Tool Steel (including Die Casting Die and Plastic Mold Steel, Drill Rod, Tool Bits, and Hollow Tool Steel Bars) . . . Stainless Steel (Sheets, Bars, Wire, Billets, Electrodes) . . . Max-el, Hy-Tuf, AISI Alloy . . . Onyx Spring, Hollow Drill Steel and other special purpose steels.

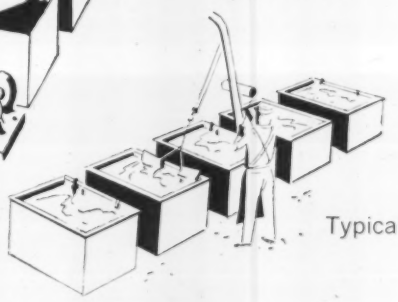
CRUCIBLE WAREHOUSE SERVICE

Crucible Steel Company of America

Treat Metals Fast and Economically with ACP *Chemicals and Processes*



Typical power spray system.



Typical immersion system.

ACP produces the chemicals for treating most metals—to clean them, to prepare them for further processing, to improve corrosion resistance and paint adhesion. It has the experience and the personnel to apply these chemicals economically and effectively, too. Here are just a few of the many products and processes ACP offers:

ACP GRANODINE®—a phosphate coating process for steel which provides an excellent bond for paint and greatly improves the corrosion resistance of the paint system.

ACP ALODINE®—an amorphous coating process for aluminum which protects both painted and unpainted metal and anchors the paint finish.

ACP LITHOFORM®—a phosphate or chromate coating process which prevents objectionable chemical reaction between metal and paint, keeps paint on zinc and cadmium surfaces.

ACP DEOXIDINE®—a phosphoric acid metal cleaner which removes rust and organic soils, destroys rusters, prepares steel, aluminum, brass, copper and other metals for painting.

ACP METAL CLEANERS—Ridoline,® alkaline metal cleaner and Ridosol,® solvent-detergent metal cleaner—remove metal preservatives and metal working lubricants from metals in process.

ACP RODINE®—pickling acid inhibitors which reduce acid consumption, save steel. They also minimize pitting, burning and embrittlement and reduce the formation of acid fumes.

Write for the "ACP GUIDE to the chemical treatment of metals."

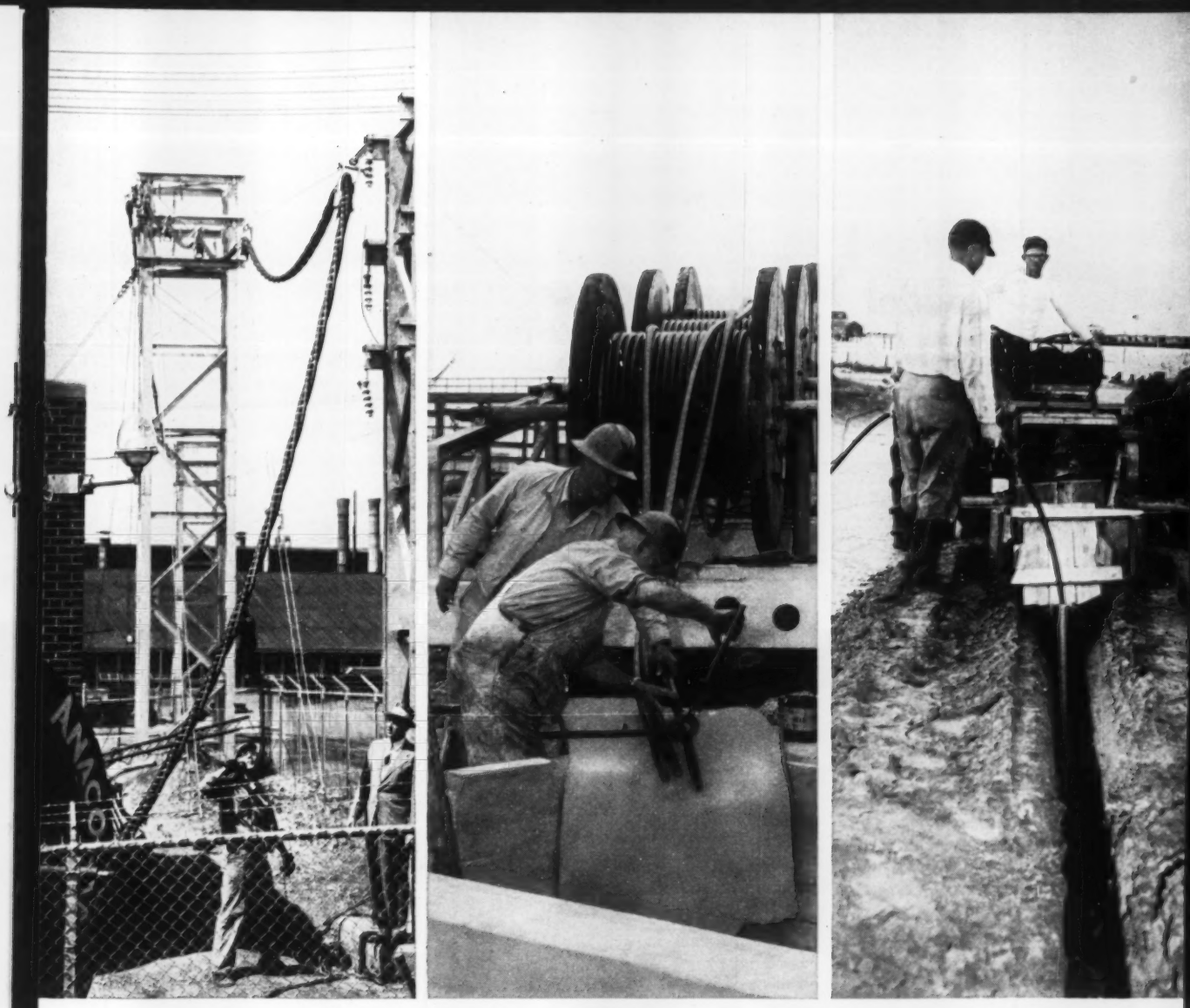
Learn about the latest developments in metalworking chemicals. Visit us at the Metal Show, Booth 201.

CHEMICALS ACP PROCESSES

AMERICAN CHEMICAL PAINT COMPANY, Ambler 19, Pa.

DETROIT, MICH. • ST. JOSEPH, MO. • NILES, CALIF. • WINDSOR, ONT.

New Chemical Horizons for Industry and Agriculture



Overhead . . . in ducts . . . underground

Order one cable for all three jobs . . . Anaconda Durasheath

Overhead . . . in ducts . . . underground. Use Durasheath* neoprene-jacketed cable for every type of power application up to 15 kv. Tough jacket resists weather, soil acids, abrasion, mechanical injury.

One continuous run without splices. Run Durasheath from underground, to overhead, to ducts, *in one length* without splicing. Light, flexible, it handles easily. Costs less to install.

Stock one cable instead of three. You save space, paperwork with all-purpose Durasheath. One cable does the work of three. You cut inventory. Versatile Durasheath excels everywhere.

See the Man from Anaconda or your Anaconda distributor for full information. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Trade Mark 97362

LIVE BETTER ELECTRICALLY

ASK THE MAN FROM **ANACONDA®**

FOR **DURASHEATH CABLE**

lodge & shipley model X lathe paid for itself in just 18 months!

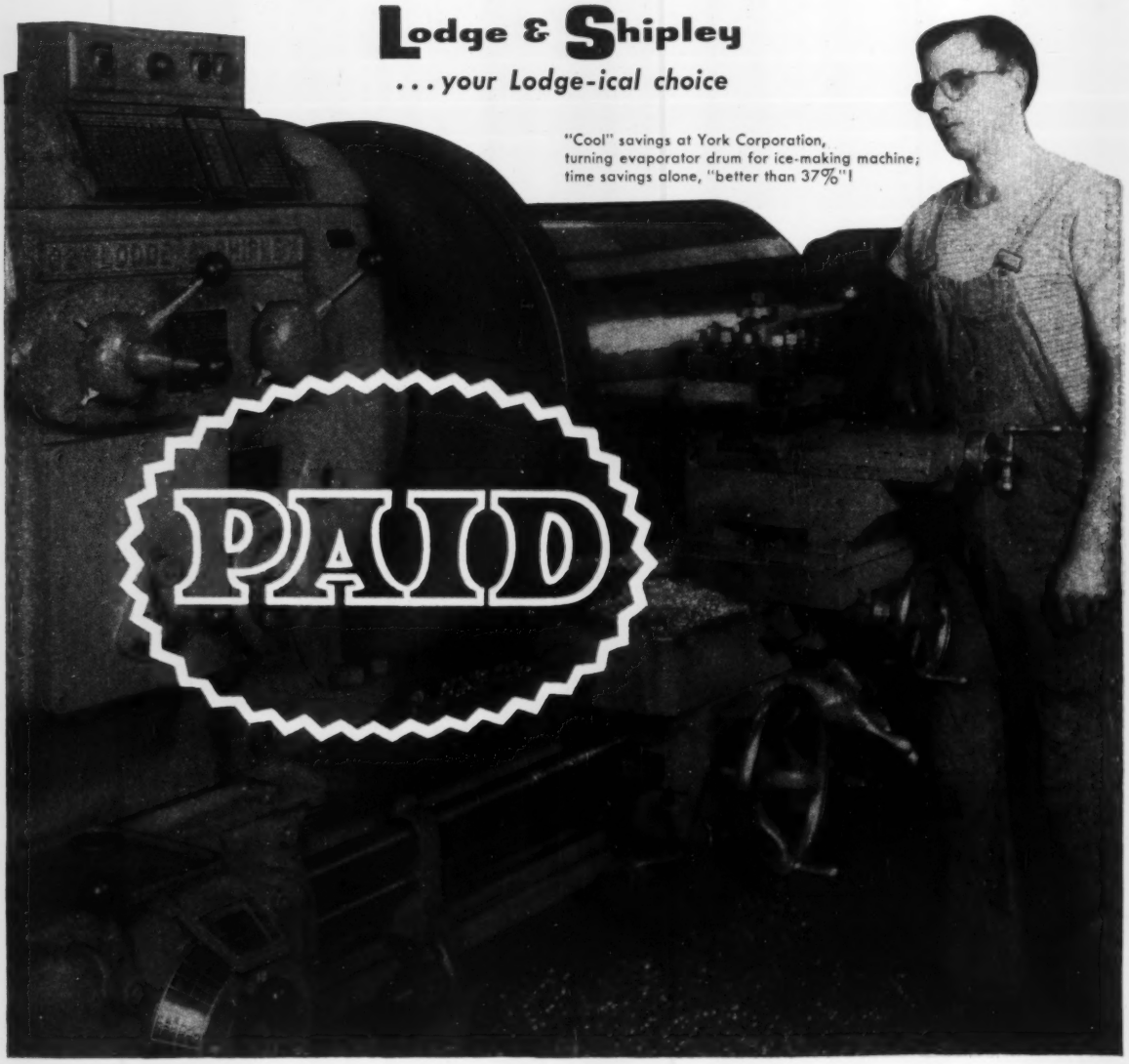
Time savings on a single workpiece, an evaporator drum 24" in diameter and 35" long, have paid for a Model X Lathe in just 18 months. The user, York Corporation, Division of Borg-Warner, records per piece savings at $25.92, saving 172.8 minutes against a previous time of 465.5 minutes per piece. Annual savings figure to $12,400!

Conservatively priced yet ruggedly durable, Lodge & Shipley Model X Lathes are an outstanding value with speed, power and accuracy equal to lathes costing far more.

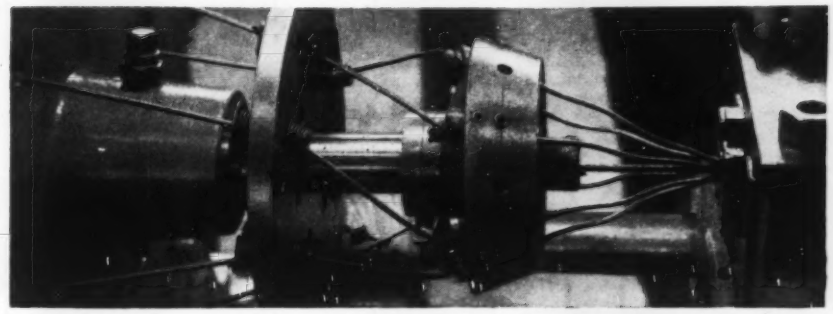
If you would like a complete case history report on the Model X performance outlined above, write today: **The Lodge & Shipley Co., 3070 Colerain Ave., Cincinnati 25, Ohio.**

Lodge & Shipley

. . . your Lodge-ical choice



"Cool" savings at York Corporation, turning evaporator drum for ice-making machine; time savings alone, "better than 37%"!



Close-up view of preforming Lang Lay rope by the quill head method in Upson-Walton's Cleveland plant. Stranded wires are threaded through a guide-plate to the quills for preforming of strands prior to entering the closing dies.

YOUNGSTOWN "YOLECTRO" ROPE WIRE

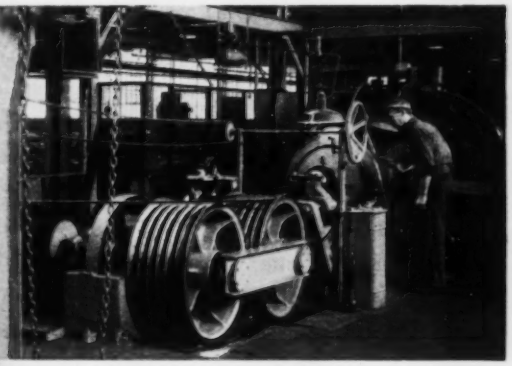
. . . builds strength and safety into **UPSON-WALTON** *wire rope*

Strength and safety are qualities characteristic of Upson-Walton's complete line of wire rope and rope fittings. For nearly 86 years this progressive Cleveland manufacturer has kept their product quality at the highest possible level.

Playing an important part in the Upson-Walton story is Youngstown "Yolectro" High Carbon Rope Wire. It's the basic material used to fabricate their various grades of wire rope. "Yolectro" Rope Wire's high degree of strength, toughness, abrasion resistance, gage uniformity and proper flexibility all contribute to the quality associated with Upson-Walton products.

"Yolectro" Rope Wire is closely quality-controlled throughout all its production operations from iron ore mining to final drawing and coating. This guarantees the desired balance of properties to meet your most exacting requirements. Why not make "Yolectro" your permanent specification for quality production? It's available with either a Bright or Galvanized finish in all AISI high carbon grades.

Metallurgical assistance or additional information is available from your nearest Youngstown District Sales Office. Why not write or phone them today?



Upson-Walton's 32" closer is capable of closing wire rope up to 1¾" in diameter of six-strand construction. Bobbins of stranded wire are loaded into the cradles of the machine and guided to the preforming head and closing dies where it is closed into finished wire rope. Finished wire rope consists of stranded wire from 7 to 41 wires per strand closed around a fibre or steel core, depending upon customer requirements and applications.

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices - Youngstown 1, Ohio

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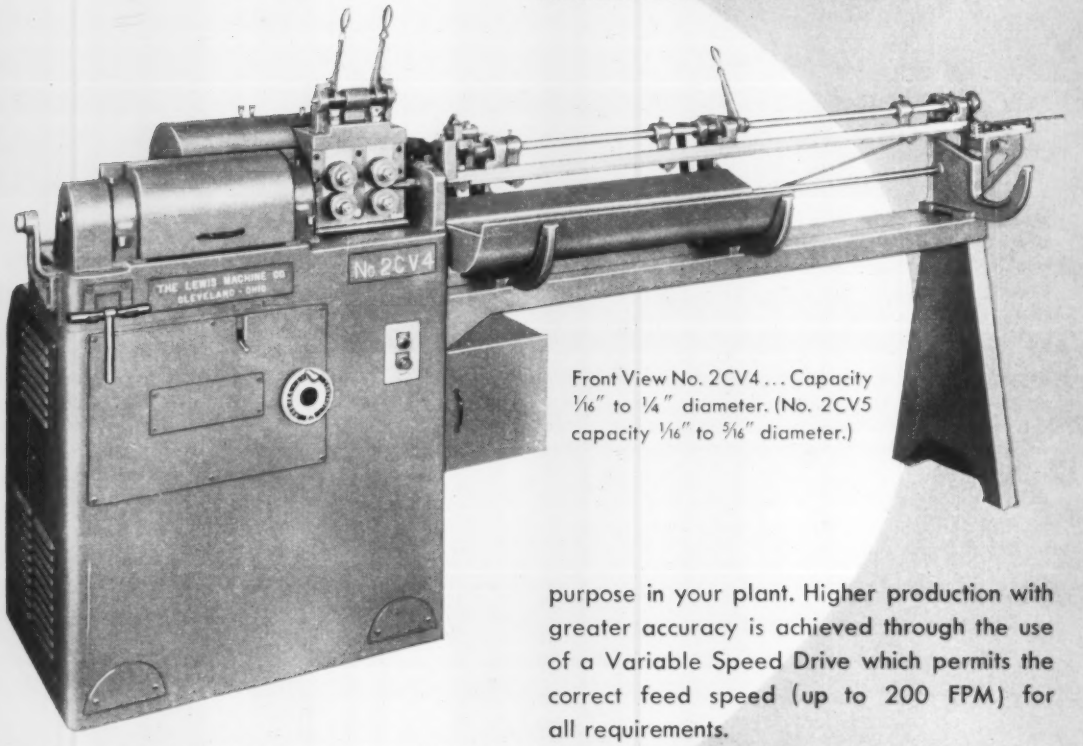
THE NEW LEWIS Convertible*

AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINES WITH VARIABLE SPEED DRIVE AND DUAL-CENTER STRAIGHTENER ARBOR



Front View No. 2CV4 . . . Capacity 1/16" to 1/4" diameter. (No. 2CV5 capacity 1/16" to 5/16" diameter.)

* The new Lewis No. 2CV series is equipped with our Dual-Center Rotary Straightener Arbor and can be quickly converted to handle shapes by installing our interchangeable Roll Straightener.

This convertible feature introduces a new flexibility in wire straightening and cutting operations . . . one machine can serve a double purpose in your plant. Higher production with greater accuracy is achieved through the use of a Variable Speed Drive which permits the correct feed speed (up to 200 FPM) for all requirements.

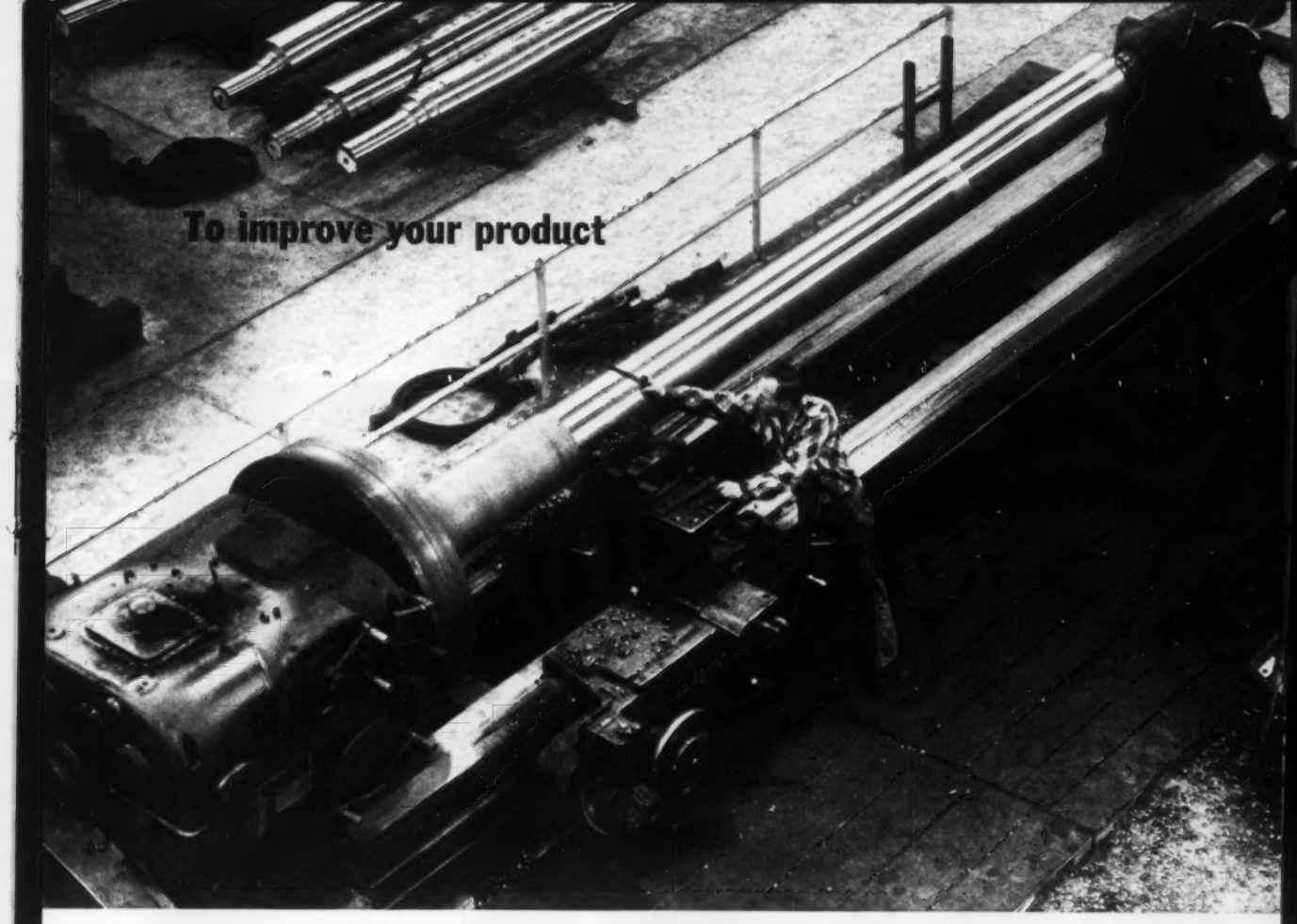
The outstanding feature of this series is the DUAL-CENTER STRAIGHTENER ARBOR (Pat. Pending) for round wire. This feature increases the range of the machine and makes it possible to precision straighten small diameters below the capacity of other machines.

Other models available to handle .012" to 1" diameter, as well as shapes.

See No. 2CV4 and the sensational No. 4FH at the Lewis Booth No. 1418 at the Metal Show, Chicago, Nov. 4-8

THE LEWIS MACHINE COMPANY

3441 East 76th Street • Cleveland 27, Ohio • A Division of Curtis Mfg. Co.



NEW FROM ALCO AT LATROBE:
OPEN-DIE FORGINGS FOR INDUSTRY

Same ALCO steel, same intense quality control as ALCO circular forgings; Hi-Qua-Led Steel® also available

ALCO now makes open-die forgings up to 40 ft long and 30,000 lb at its integrated Latrobe, Pa. plant. If you use open-die forgings, this means that quality forgings are now readily available for your product. Here are some of the advantages you can expect:

High uniformity among forgings of the same specifications. ALCO quality control continuously checks progress of each piece through production.

Exact conformance to your specifications. Even in steel chemistry, ALCO's open-hearth production of its own steel assures accurate carbon or additive content. Any AISI grade carbon or alloy is available.

Lower cost, especially if you do extensive machining. ALCO alone offers Hi-Qua-Led Steel forgings. They can lower your machining costs by as much as 50 per cent.

For specific information contact the nearest ALCO sales office, or for new full-color brochure write Spring & Forge Division, Dept. OCF-4, P. O. Box 1065, Schenectady 1, N. Y.

ALCO

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NEW YORK
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Locomotives • Diesel Engines • Nuclear Reactors • Springs • Steel Pipe • Forgings • Oil-Field Equipment

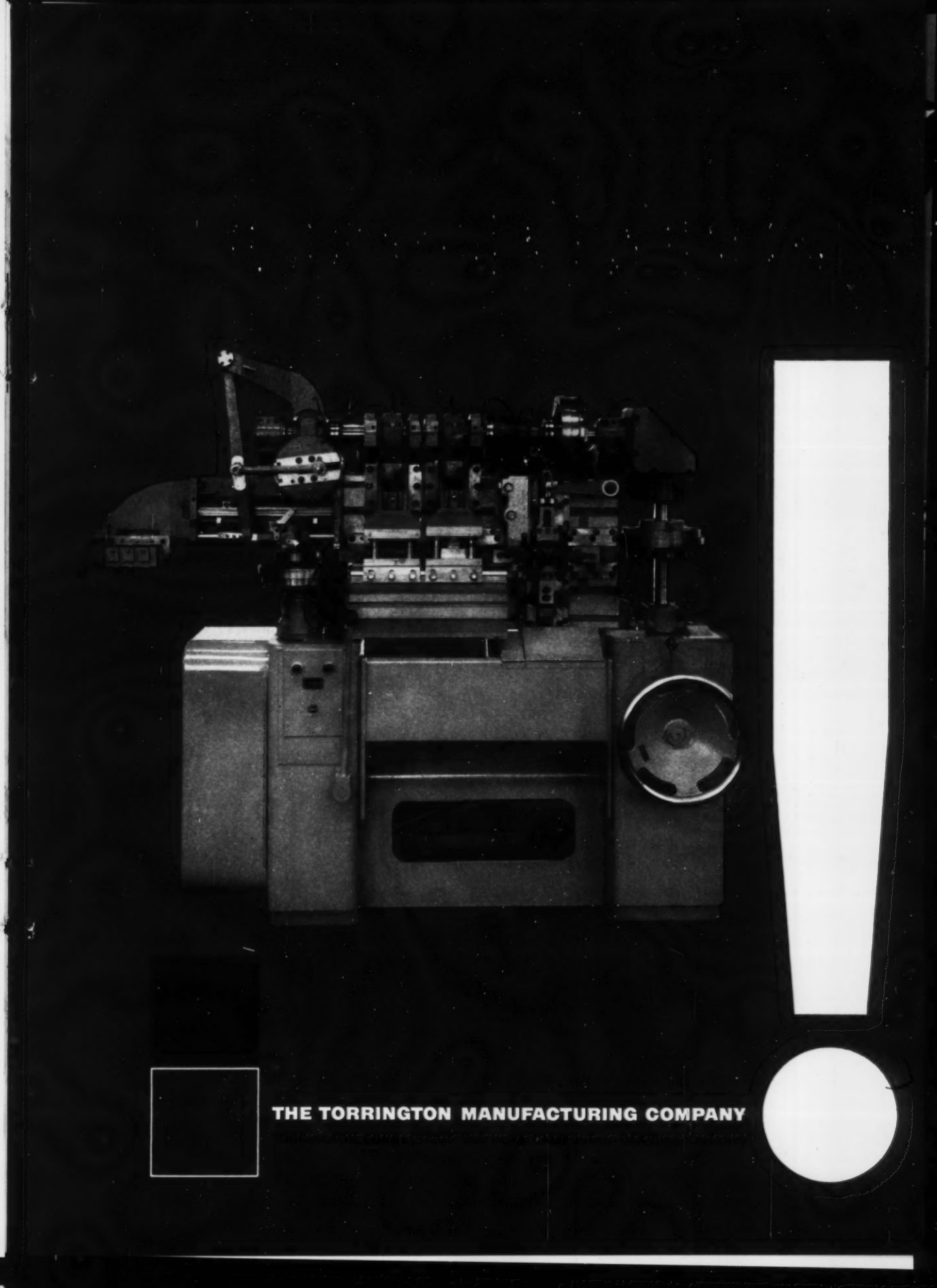
A Great New Vertical *4-Slide*

The Torrington Verti-Slide!

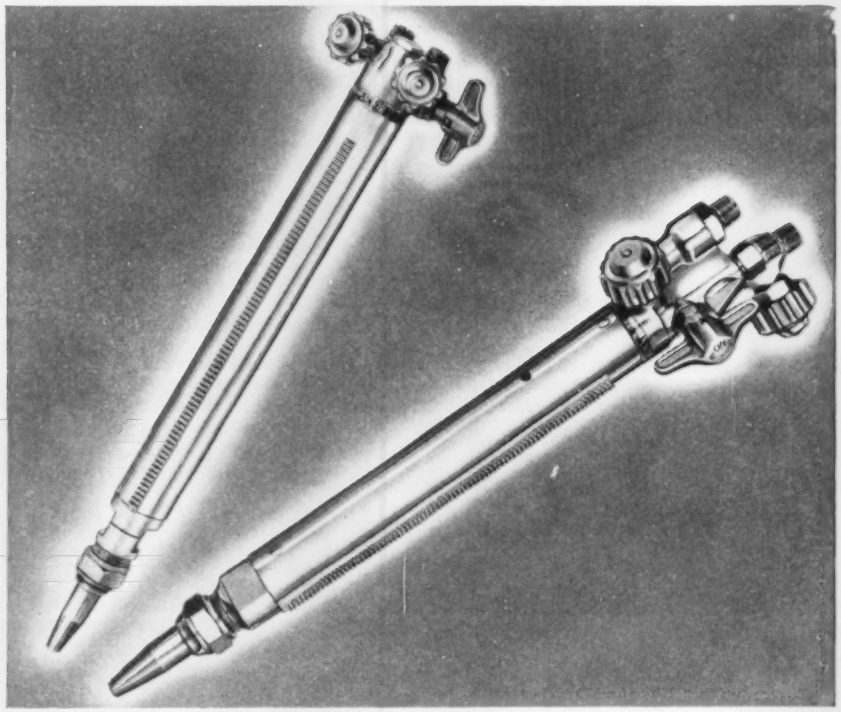
This important innovation in the basic field of 4-slide production equipment offers so many advanced design features, performance advantages and cost-cutting facilities that it is making national news as a development of major interest to U. S. industry.

NATIONAL NEWS

For the Torrington *Verti-Slide* was designed to meet a fundamental need for greater versatility, lower tooling cost, faster set-up time and reduced floor space. We urge you to investigate the *Verti-Slide* in detail at the Metal Show, Booth 1567, or through direct communication with our Machine Division.



THE TORRINGTON MANUFACTURING COMPANY



NEW VICTOR

MACHINE CUTTING TORCHES

Two Hose Type

MT-200 SERIES for medium pressure acetylene.

MT-200 LPCG SERIES for low or medium pressure fuel gases such as city, natural or petroleum gases.

Three Hose Type

MT-300A SERIES for medium pressure acetylene.

MT-300A LPCG SERIES for low or medium pressure fuel gases such as city, natural or petroleum gases.

Designed for general purpose machine cutting. All commercial fuel gases commonly used for machine cutting can be utilized by selection of the proper size and type of Victor cutting tips and torch model.

These New Victor machine cutting torches feature—

Stainless steel mixing chamber.

Time-tested Victor Spiral Mixer for maximum efficiency and heat resistance.

Convenient control valves for ease of operation.

Popular quick-acting cutting oxygen valve with long life "O" ring packing.

Preheat gas valves with stainless steel ball points and special packing design to hold valve adjustments steady.

For model, type and size best fitted to your needs, call your VICTOR dealer . . . or write us for descriptive bulletins.

VICTOR for welding

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

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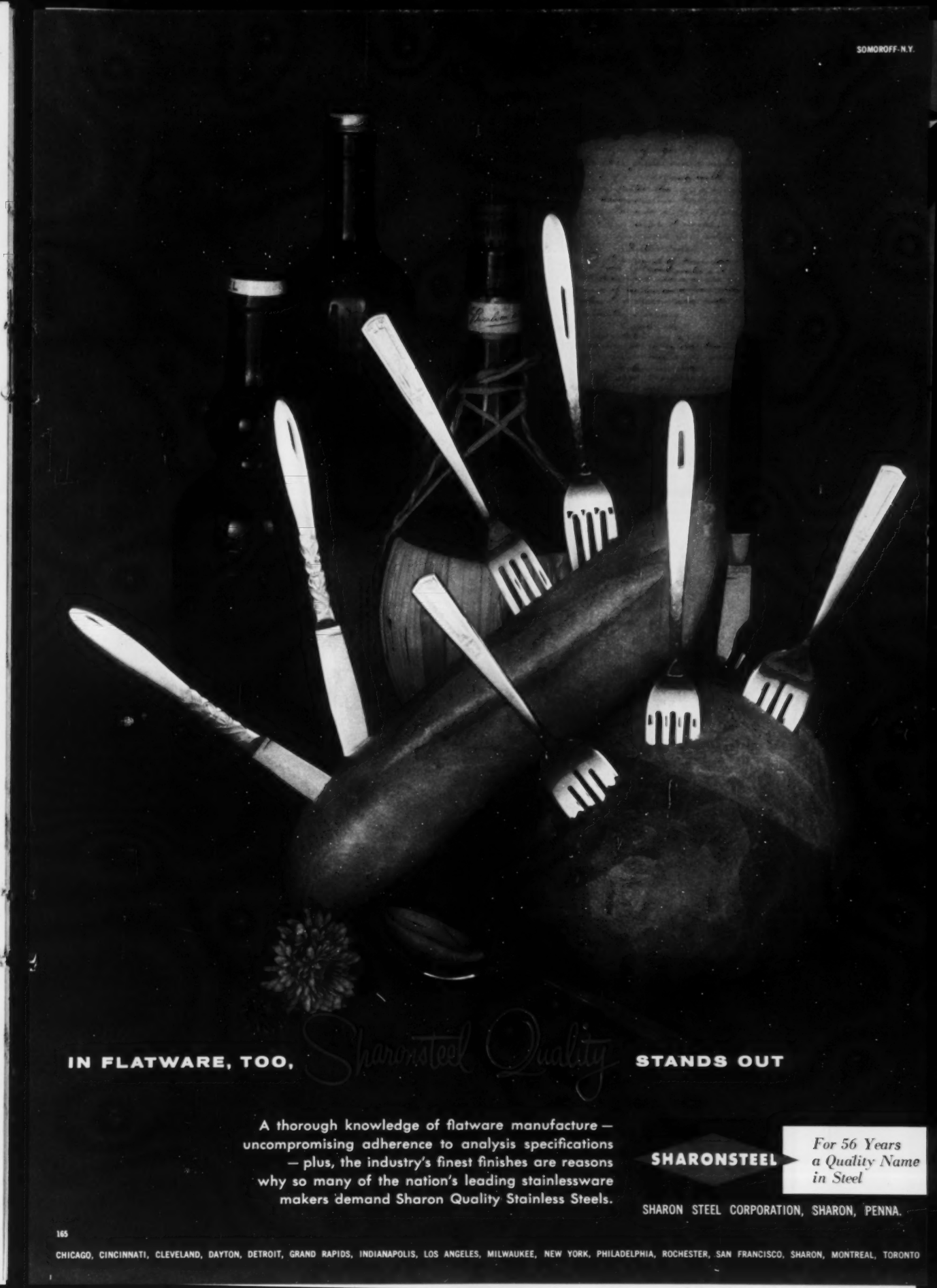
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IN FLATWARE, TOO, Sharonsteel Quality STANDS OUT
A thorough knowledge of flatware manufacture — uncompromising adherence to analysis specifications — plus, the industry's finest finishes are reasons why so many of the nation's leading stainlessware makers demand Sharon Quality Stainless Steels.
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For 56 Years a Quality Name in Steel
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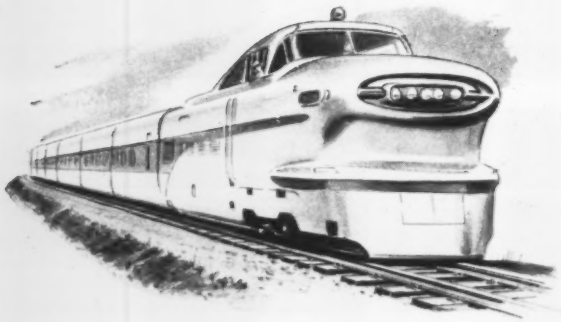
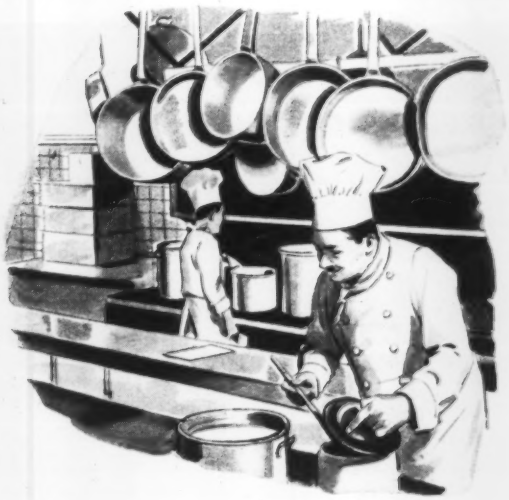
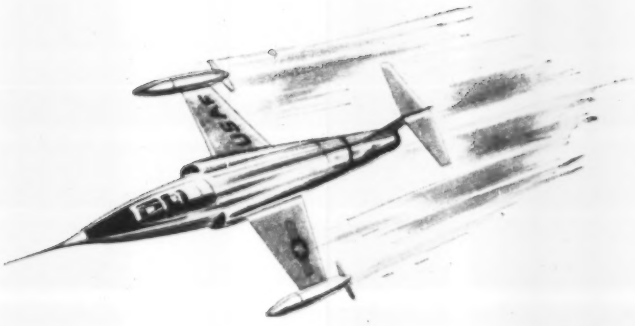
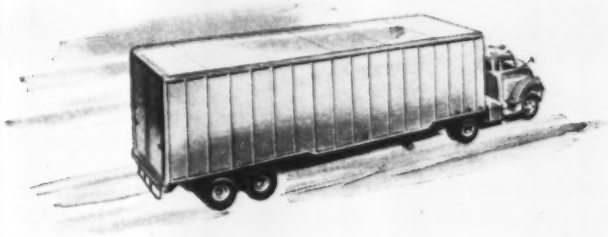
Metals do more all the time... Thanks to Alloys

Look what's happened to "200" Series









Stainless Steels

Growing demand...availability...economy are putting these useful steels into more and more new products

Manufacturers are finding "200" Series Stainless Steels *equally* practical for such different applications as kitchen utensils, truck bodies, building trim, appliances and automobile trim—to name a few. The usefulness and application of "200" Series Stainless Steels *grow* as designers, fabricators and marketers discover how well they combine strength, beauty, and corrosion resistance with low cost.

ELECTROMET produces more than 100 alloys, including those containing chromium, manganese and nitrogen for making "200" Series Stainless Steels. These steels are the result of basic work carried out at ELECTROMET's research laboratories. Stainless steel producers have been granted royalty-free licenses under patents covering these developments.

Learn more about these new and useful steels. In economy . . . in availability . . . in practicality—they might well solve your current manufacturing problems. Send for booklet 44. Electro Metallurgical Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. In Canada: Electro Metallurgical Company, Division of Union Carbide Canada Limited, Toronto.

Electromet

FERRO-ALLOYS AND METALS

UNION CARBIDE

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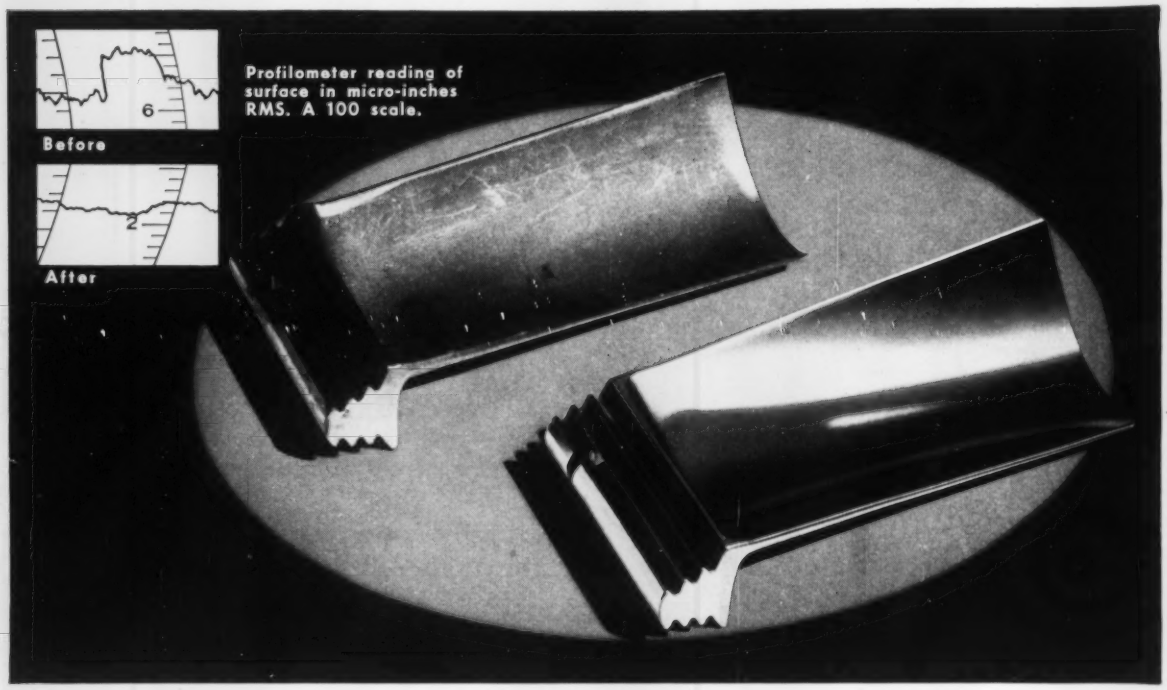

Cut parts finishing costs, maintain exact tolerances, get absolute uniformity with *Roto-Finish* processes

Roto-Finish, pioneers in precision barrel finishing, offer you a complete finishing service. Savings on deburring, descaling, grinding, polishing, coloring and surface improvement are tremendous. Expensive hand finishing methods can be eliminated.

Roto-Finish processes are controlled to produce the finish you need with no significant dimensional changes. You get absolute uniformity of finish in quantity lots.

Many prominent manufacturers now using Roto-Finish processes are saving money on finishing costs. (Names on request).

ROTO-FINISH CHIPS, COMPOUNDS AND MACHINES ARE OF THE HIGHEST QUALITY

Roto-Finish has never sacrificed quality for the sake of price. Through the years, Roto-Finish has carried on a continuous program of process and product improvement to meet the needs of modern industry. When you choose Roto-Finish processes, you can be sure that you are getting the best in supplies, equipment and complete continuing engineering service.

ROTO-FINISH GUARANTEES RESULTS

There is no costly trial and error involved in the purchase of Roto-Finish equipment. You submit unfinished parts to Roto-Finish along with a finished sample and a description of the finish you require. These sample parts are processed in the Roto-Finish Sample Processing Laboratories, where experienced engineers determine the combination of chips, compounds, and machine required to do the job. Roto-Finish guarantees to reproduce the same results in your plant, using the Roto-Finish processes, that are achieved in sample processing. This service demonstrates for you exactly what you can gain by using Roto-Finish processes.

The sample processing service is available to help you with your finishing problem. Take advantage of this opportunity to save on finishing costs. Send samples of finished and unfinished parts and details of the type of finishing equipment available in your plant.

SEND FOR THIS FREE TECHNICAL DATA FOLDER

It describes the basic process, chips and compounds and the complete Roto-Finish line of standard and special machines.

Roto-Finish COMPANY

3717 Milham Road, Kalamazoo, Mich.

P. O. Box 988

Phone: FI 3-5578

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BOHN EXPANDS EXTRUDED TRIM FACILITIES TO ALL INDUSTRY!

One of America's oldest extruders, with years of anodizing and fabricating experience, Bohn now offers:

- Complete facilities for plain and color anodizing, decorative painting, silk screening, buffing, etching, chemical brightening, fabricating!
- Complete quality control—a prime requisite for the best possible finished products!
- Extruded trim in a wide range of sizes and shapes!
- Design assistance by experienced Bohn Engineers and Metallurgists!

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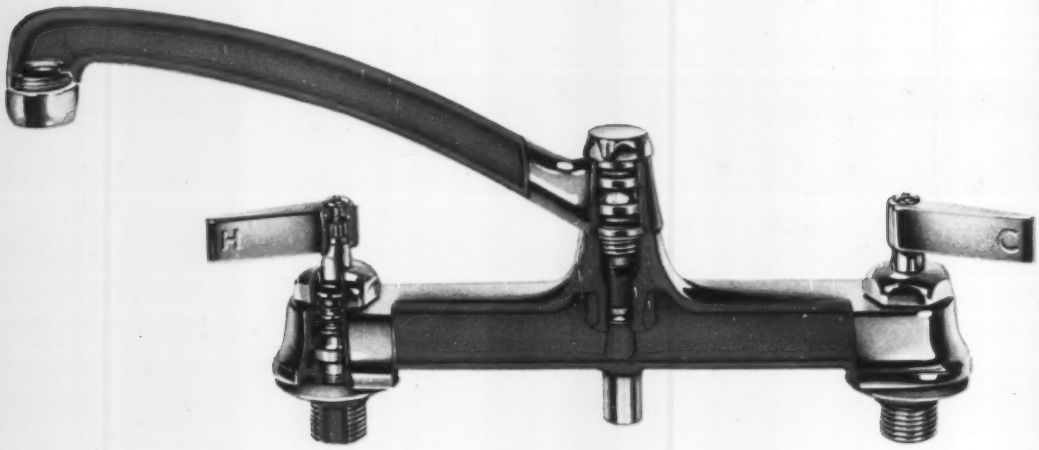

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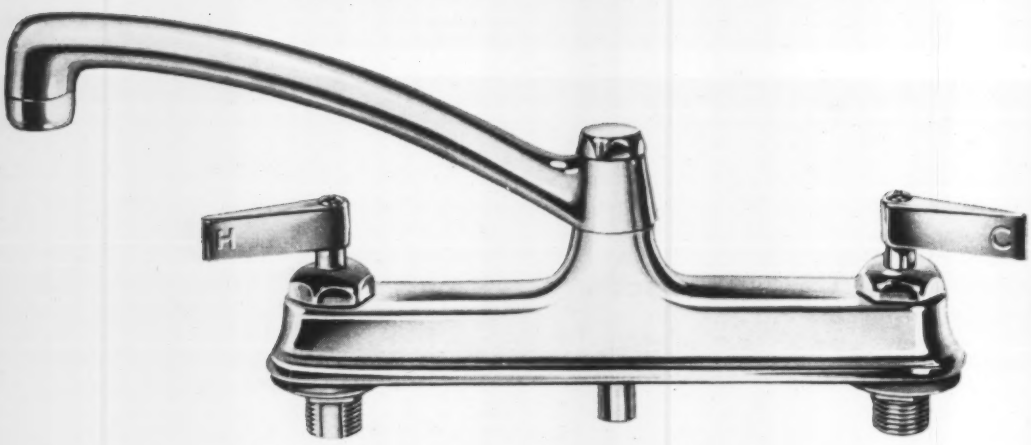

...and your faucet lasts!

Why does a famous manufacturer tell the plumbing industry:

"Every bit of metal in a Kohler fitting, underneath the chromium plating, is Brass."

It is because he has nothing to hide.

He knows that substitute metals and alloys can be concealed under plating. But, as Kohler says: *"Brass has no equal for serviceable and satisfactory plumbing fittings."*

That's why it is important that . . . underneath the chromium . . . fittings are *Brass.*

Kohler can come right out and say they are.

"Brass", to quote Kohler, "is superior in wearing qualities. Brass has maximum resistance to corrosion. Brass is easiest and most economical to maintain."

Those who offer the advantages of Copper and its alloys can count on the Copper Industry to make sure of an ample supply.

COPPER • BRASS • BRONZE

in over 40 Standard Alloys!

For more information on the essential role of Copper and Brass in Plumbing, write to Copper & Brass Research Ass., 420 Lexington Ave., New York 17, N. Y.

Now drill accurate holes in hard metals easily . . . with the new portable "K-MATIC"*

"K-MATIC" FEATURES

- Develops up to 1000-lb. thrust
- Positive power feed .002" or .003" per revolution
- Simple single-lever operation
- 1¼" stroke length
- Instant automatic bit return
- Adjustable depth stop

This man is standing by while a Keller Tool "K-Matic" portable drilling unit does its work. This new production line drilling unit is only 12" long, weighs less than five pounds; yet it develops up to 1000-lb. thrust, has positive power feed and handles drills up to ⅜".

Thrust is developed against a patented Keller Tool drill bushing tip that is easily locked to a jig by any of several simple methods. Hard metals, soft metals and sandwich construction are drilled so cleanly that reaming is often unnecessary.

Send now for complete information and specifications.

* Trade-Mark

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IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

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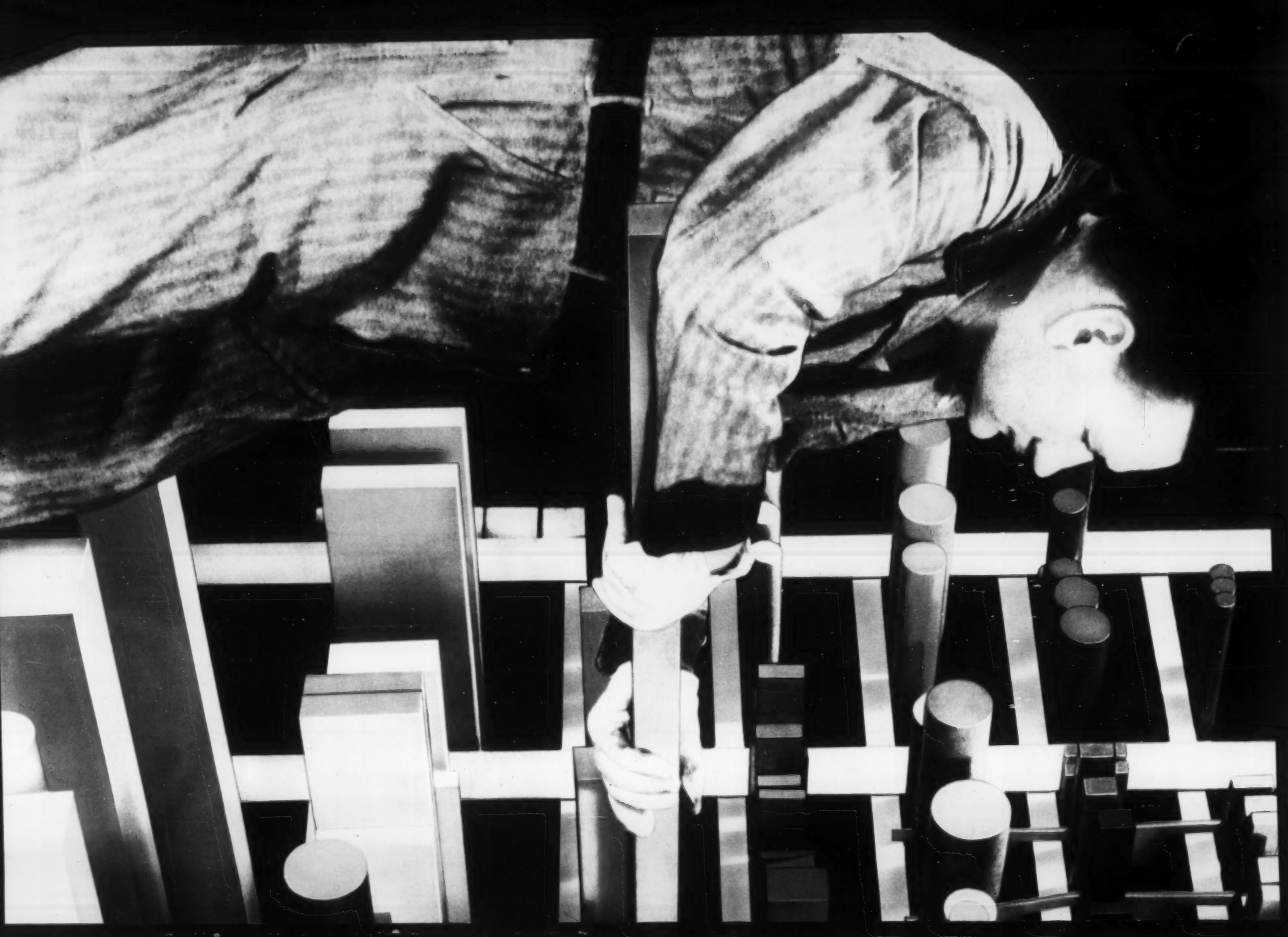
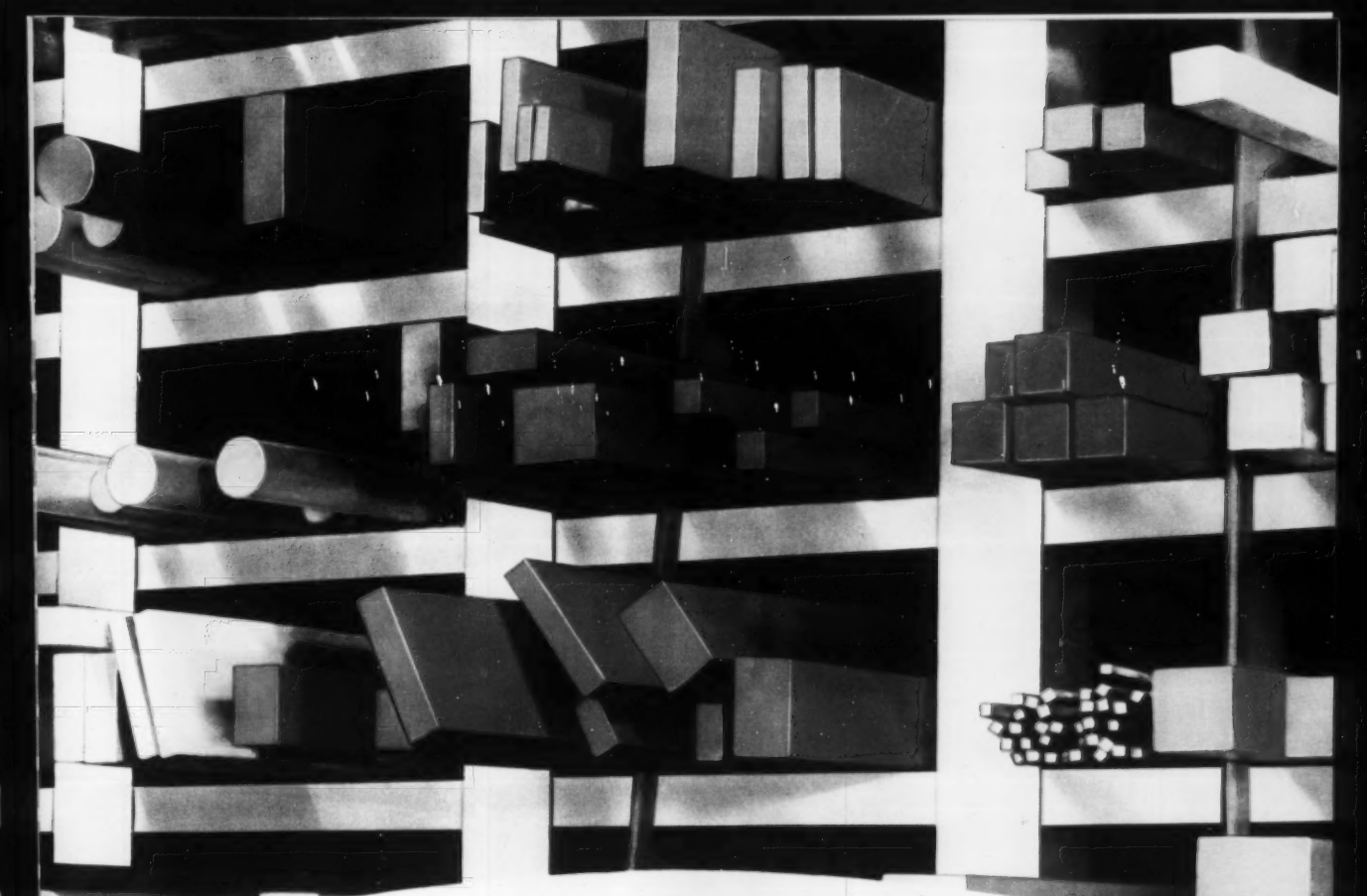
Gardner-Denver Company, Quincy, Illinois





Take this *new look* at what you get when you call *Carpenter*

There are many reasons why it isn't profitable to carry too large a stock of specialty steels in your shop. Perhaps excessive *manpower* is tied up in handling large inventories . . . maybe you are trying to free *dollars* for more productive use . . . or cut down on worrisome paper work. If any of these is a problem, there is a way out!

But it hinges on the *ability* of your steel supplier to meet your day-to-day specialty steel needs, quickly and without hesitation.

Here's what Carpenter is doing to help you: We're continually "tailoring" local warehouse stocks of tool, alloy and stainless steels to meet your needs. You can expect complete application service from your Carpenter representative . . . friendly cooperation from order desk people, warehouse crew and office staff. Another example of service is Carpenter's pioneering in *completely* identifying tool steel bars. As shown in the photo, the *entire* surface of every Carpenter Matched Tool and Die Steel bar is colored *full length* . . . each grade has its own distinctive color. Call your nearest Carpenter Service-Center, any time. The Carpenter Steel Company, Dept. 221, Reading, Pa.

Carpenter

Mill-Branch Warehouse Service

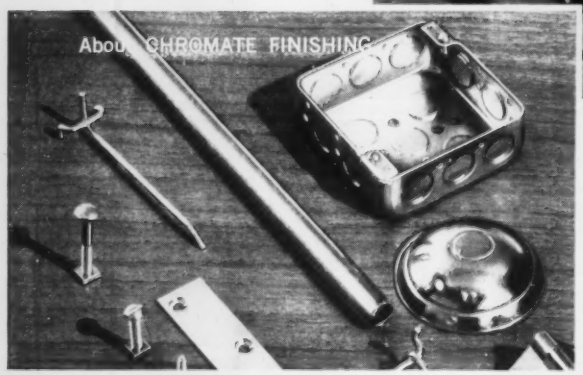
Mill-Branch Warehouses, Offices and Distributors in Principal U.S. Cities

from: Metal & Thermit to: The IDEA Minded

New type chromium plate solves corrosion problems

Hydraulic piston rods plated with Unichrome Crack-Free Chromium by Bendix Products Division for their popular power steering mechanisms are helping to make driving safer and easier than ever. This innovation by Bendix provides increased protection against wear, corrosion, and hydraulic leaks.

Compared to ordinary chromium, Unichrome Crack-Free Chromium, developed by Metal & Thermit, stands out on resistance to corrosion, thermal shock, wear, and prevention of hydraulic fluid loss.



Costs little to brighten up sales

Given a choice, the customer always picks the brighter product. That's one good reason to consider two newly developed Unichrome Dips that produce bright chrome-like finishes on zinc plated or galvanized products. Extreme economy is another. Costs for these dip compounds range between 30¢ and 60¢ per 1000 sq. ft. of surface treated. They're increasing shelf life and sales appeal of even the most competitively priced products . . . such as toy wheels, electrical conduit and boxes, and rough hardware.

Tank car turnaround costs less

"Very good", reported the inspector at a large chemical company. He was examining the interior of one of their tank cars coated with Unichrome Lining B-124. Twenty-two trips in contact with highly corrosive 92% phenol left little mark on the protective coating.

Companies using tank cars or tanks can benefit from this experience. With skilled firms in key locations now available to apply linings to open or closed tanks, no company has to forego the maintenance-saving, cost-cutting protection of enduring Unichrome Tank and Drum Linings.

PLATING MATERIALS
ORGANIC COATINGS
TIN & TIN CHEMICALS
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HEAVY MELTING SCRAP

METAL & THERMIT CORPORATION

GENERAL OFFICES: RAHWAY, NEW JERSEY

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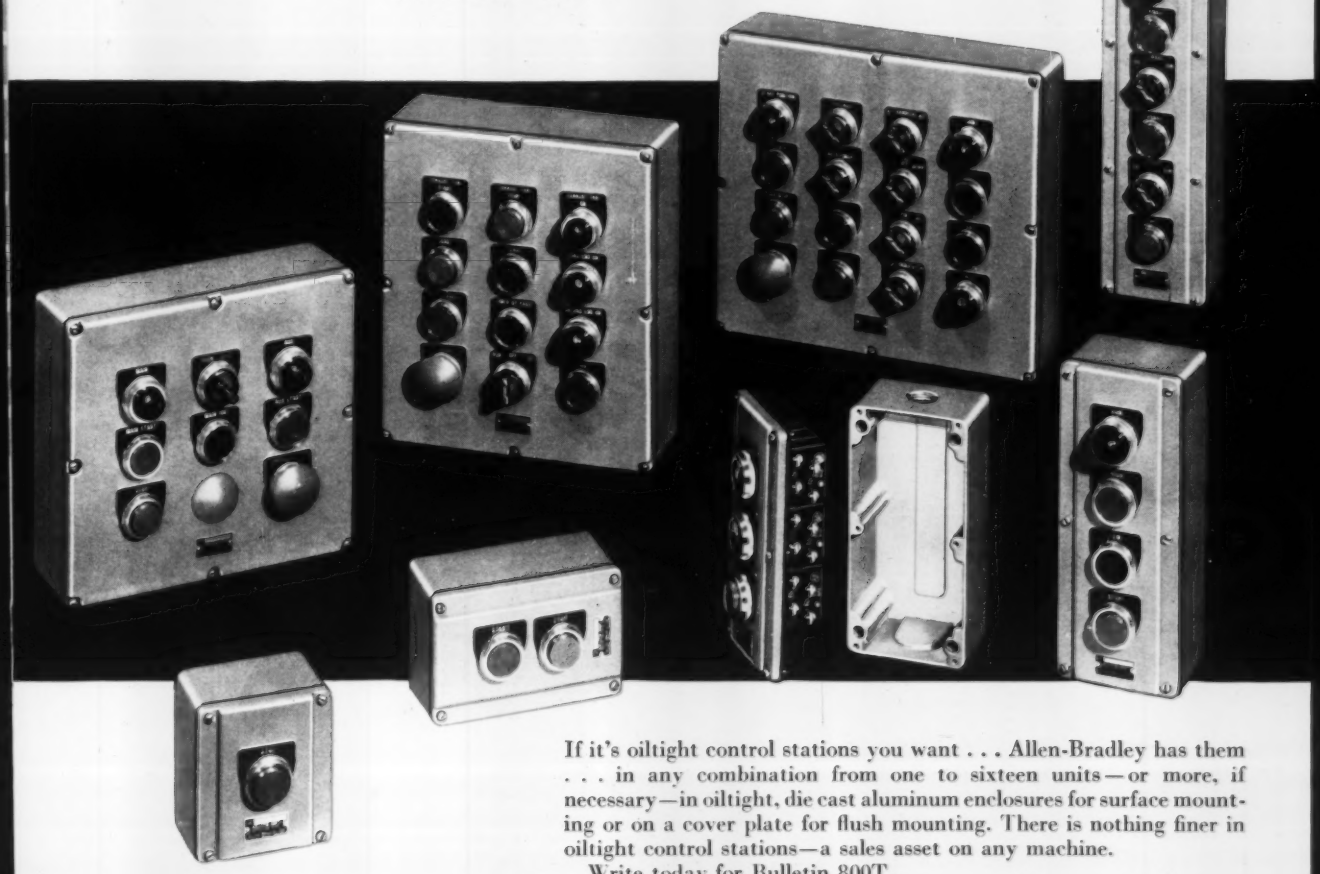
In Canada: Metal & Thermit—United Chromium of Canada, Limited, Rexdale, Ont.

NOTHING FINER IN oiltight control stations

BULLETIN 800T

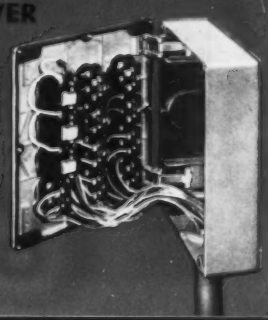


If it's oiltight control stations you want . . . Allen-Bradley has them . . . in any combination from one to sixteen units—or more, if necessary—in oiltight, die cast aluminum enclosures for surface mounting or on a cover plate for flush mounting. There is nothing finer in oiltight control stations—a sales asset on any machine.

Write today for Bulletin 800T.

HINGED COVER

The 9, 12, and 16-unit control stations have hinged covers. The hinge can easily be changed in the field from one side to the other.



ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

10-57-RM

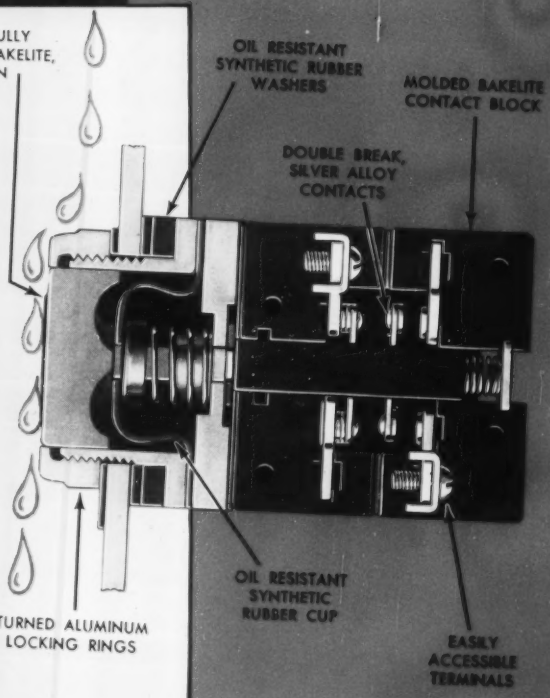
for machine tool application . . .

BULLETIN 800T

oiltight control units

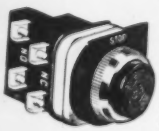
These rugged, reliable units were designed as pilot controls for a-c and d-c magnetic motor control. The oil resistant synthetic rubber cup and washers keep cutting fluids and oil away from the contacts, and thus prevent trouble. Push button units can be furnished with one, two, or four contact blocks—each equivalent to a separate single pole, double throw, switch unit.

For attractive appearance plus long life with reliable operation, select Allen-Bradley control units.

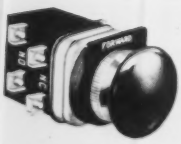

LARGE, FULLY GUARDED, BAKELITE, BUTTON
OIL RESISTANT SYNTHETIC RUBBER WASHERS
MOLDED BAKELITE CONTACT BLOCK
DOUBLE BREAK, SILVER ALLOY CONTACTS
OIL RESISTANT SYNTHETIC RUBBER CUP
TURNED ALUMINUM LOCKING RINGS
EASILY ACCESSIBLE TERMINALS

PUSH BUTTONS

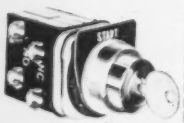
Flush Head Start" Button



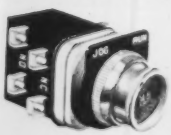
Extended Head "Stop" Button



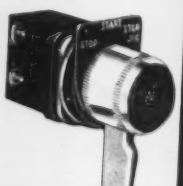
Mushroom Head for Easy Operation



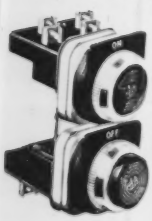
Push Button with Cylinder Lock



Push Button with "Selector" Sleeve



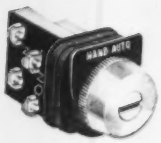
Wing Lever Push Button



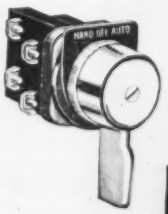
Maintained Contact Push Buttons

SELECTOR SWITCHES

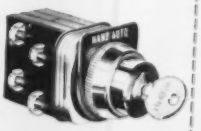
Three-Position Selector Switch



Two-Position Coin Slot Selector Switch



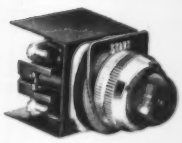
Wing Lever Selector Switch



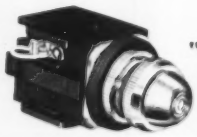
Selector Switch with Cylinder Lock

PILOT LIGHTS

Transformer Type Pilot Light



Full Voltage Pilot Light



"Press-to-Test" Pilot Light

A-B QUALITY

ALLEN-BRADLEY MOTOR CONTROL QUALITY

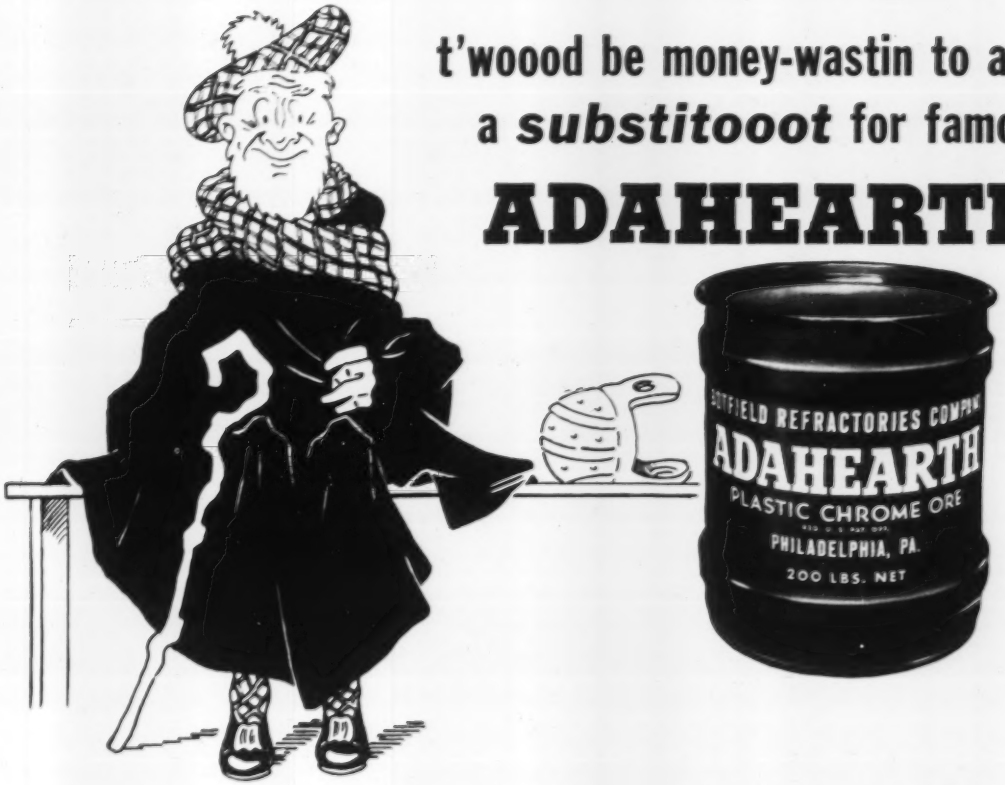
Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

10-57-RM

Hoots Mon!

t'woood be money-wastin to accept a *substitooot* for famous

ADAHEARTH



". . . ye canna' beat ADAHEARTH as a superior, longer lastin' refractory for forming monolithic hearths . . . 'tis a chemically neutral, chrome base refractory with a plastic consistency . . . has unusually strong air-set; resists spalling, molten metal, and abrasion; has low porosity, high density, absolute homogeneity of structure . . . ADAHEARTH requires fewer man-hours to install . . . insures cleaner forgings and a faster-working furnace . . . sheeer money-savin'!" says Scotty.

Write for detailed Bulletin . . . Yellow Pages of 'phone directory have your nearest "ADAMANT" Distributor.

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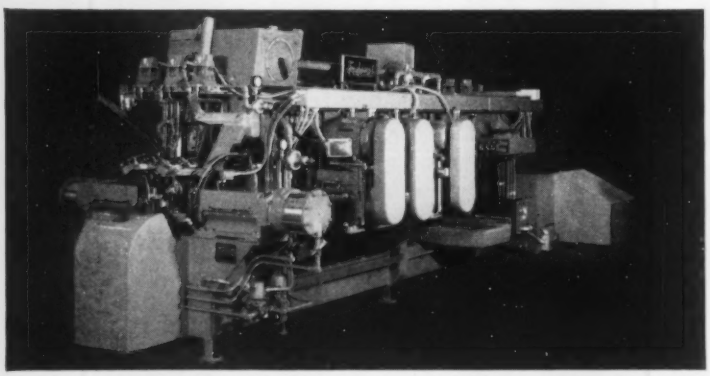
one-source production lines spark interest of volume producers...

The prospect of ordering an entire production line, ready made to produce a part to specification, has arrested the interest of many of the nation's top production engineers.

One source responsibility assuring better service; a line 100% harmonic, all stations engineered to work in perfect synchronization; integrated and automated handling of work in process; utilization of common drives and bases, reducing operating costs and floor area, are some of the advantages of the packaged line that has production people talking.

Federal/Warco pioneered the packaged line and have already produced automated lines combining such operations as blanking, forming, drawing, welding, machining, drilling, assembling on a common base.

For additional information contact the Federal/Warco representative nearest you or write direct.



This Federal Packaged Production line welds, spot faces, reams, de-burrs, sets six bolts and welds them in place . . . ejecting finished pedal brackets at a rate of 775 pieces per hour.

Federal / Warco
PACKAGED PRODUCTION LINES

THE FEDERAL MACHINE AND WELDER COMPANY - WARREN, OHIO

422 AFFILIATED WITH BERKELEY-DAVIS, INC., DANVILLE, ILLINOIS, MANUFACTURERS OF AUTOMATIC ARC WELDING EQUIPMENT.

WHY WEIRZIN®?

"It resists rust, forms easily and holds paint."

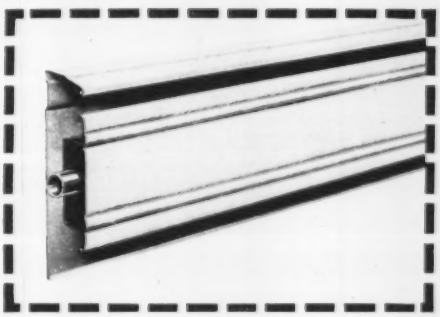
So reports the Vulcan Radiator Company, Hartford, Connecticut.

"We must bend Weirzin electrolytic zinc-coated steel like a pretzel in producing our high quality Trimline baseboard radiators. Weirzin goes right along with us—doesn't balk one bit. Our finished baseboard radiators have a constant flow of bends and turns. But in forming them, not one speck of Weirzin's protective zinc coat flakes or peels off. This assures us that recoating of our radiators is a thing of the past and that rust is a real 'goner' having no bare steel to feed upon. And, chemically treated Weirzin takes and keeps paint as if it were the natural thing to do. A decided advantage over other metals that can 'take' paint but don't hold it all."

That's Weirzin electrolytic zinc-coated steel sheets! They never give rust a start, thereby eliminating any future corrosion problem. They have a natural paint bonding surface which means the end product has a beautifully painted finish that will fit into any décor. They have the strength of their steel base which means a longer life of worry-free service.

What better characteristics could any product have to meet the exacting demands of manufacturers everywhere.

See how Weirzin can meet your requirements — better! Just write Weirton Steel Company, Dept. B-26, Weirton, West Virginia, for your free informative booklet.



WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY

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MicroRold® QUALITY STAINLESS STEEL

2D—A silvery white, but non-lustrous, surface produced by annealing and pickling cold reduced material. Steel sheets & strip in this condition are most ductile and the surface holds lubricant well for severe drawing operations.

2B—Steel in the 2D condition which is subsequently rolled on a "skin pass" or temper mill. The surface acquires a bright finish from the polished rolls. This surface is somewhat more dense and hard than 2D and is a better starting surface for later finishing and buffing operations.

No. 3—This surface is made by grinding with a No. 100 abrasive. This surface is smooth but not as reflective as 2B.

No. 4—A finer finish than No. 3 made by grinding with a No. 150 abrasive. Like No. 3, this surface is easily blended with hand grinders after forming, drawing or welding.

No. 7—Good reflectivity and brilliance made by polishing with a No. 400 abrasive. This semi-mirror finish must be protected during fabrication by adhesive paper or strippable plastics lest the finish be marred beyond repair.

BRIGHT—A highly reflective surface made by cold reducing with highly polished, glass-hard rolls. This finish is only available in Type 430 stainless.

These are our standard surface finishes that are available in types 201, 202, 301, 302, 304 and 430 except Bright which is type 430 exclusively.

These finishes are regularly supplied in sheet and coil form in widths up to 48 inches.

Since Nos. 3, 4, 7 and 430 Bright are smooth reflective surfaces, they are not recommended for severe drawing without special precautions as the mill finish may be marred. Applications such as dairy machinery, kitchen and restaurant equipment and architectural decorative work require only local forming, so these highly polished surfaces are not greatly disturbed. All mill polished sheets are carefully packed to avoid handling imperfections. Protective adhesive paper can be specified by the buyer when needed.

For specific information on recommended surface characteristics for a particular stainless steel sheet and strip application, address your request to our Product Development Dept.

WASHINGTON STEEL CORPORATION — MicroRold® — STAINLESS — SHEET & STRIP

Washington Steel *Corporation*

Producers of Stainless Sheet and Strip Exclusively

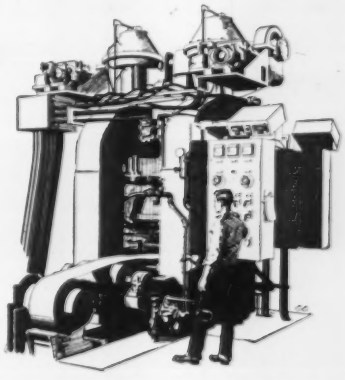
102-0 WOODLAND AVENUE, WASHINGTON, PA.

Blooms, slabs and hot strip can all be rolled in this triple-duty Bliss 4-high 15" & 32" x 24" reversing hot mill.

U-235 or magnetic alloys, it's all the same to these Bliss mills

Among the key installations with which the new Westinghouse Metals Plant at Blairsville, Pa., explores the unknown in metalworking are two unusual Bliss rolling mills. Blairsville's business is finding ways to cast, roll, forge and otherwise fabricate new and experimental metals. The materials rolled range from uranium alloys to magnetic materials so sensitive that the pressure of a finger will alter their electrical properties. The Bliss mills and handling equipment combine precision of control with the ability to stand extremely heavy rolling stresses. Large enough to provide limited production output, they can take an alloy from ingot down to 0.010" cold-rolled strip.

Whether your plans call for highly specialized mills like these or standard rolling and mill processing equipment, Bliss can help solve your problem. For more information, send for a free copy of our 60-page Rolling Mill Brochure, Catalog 40-A.



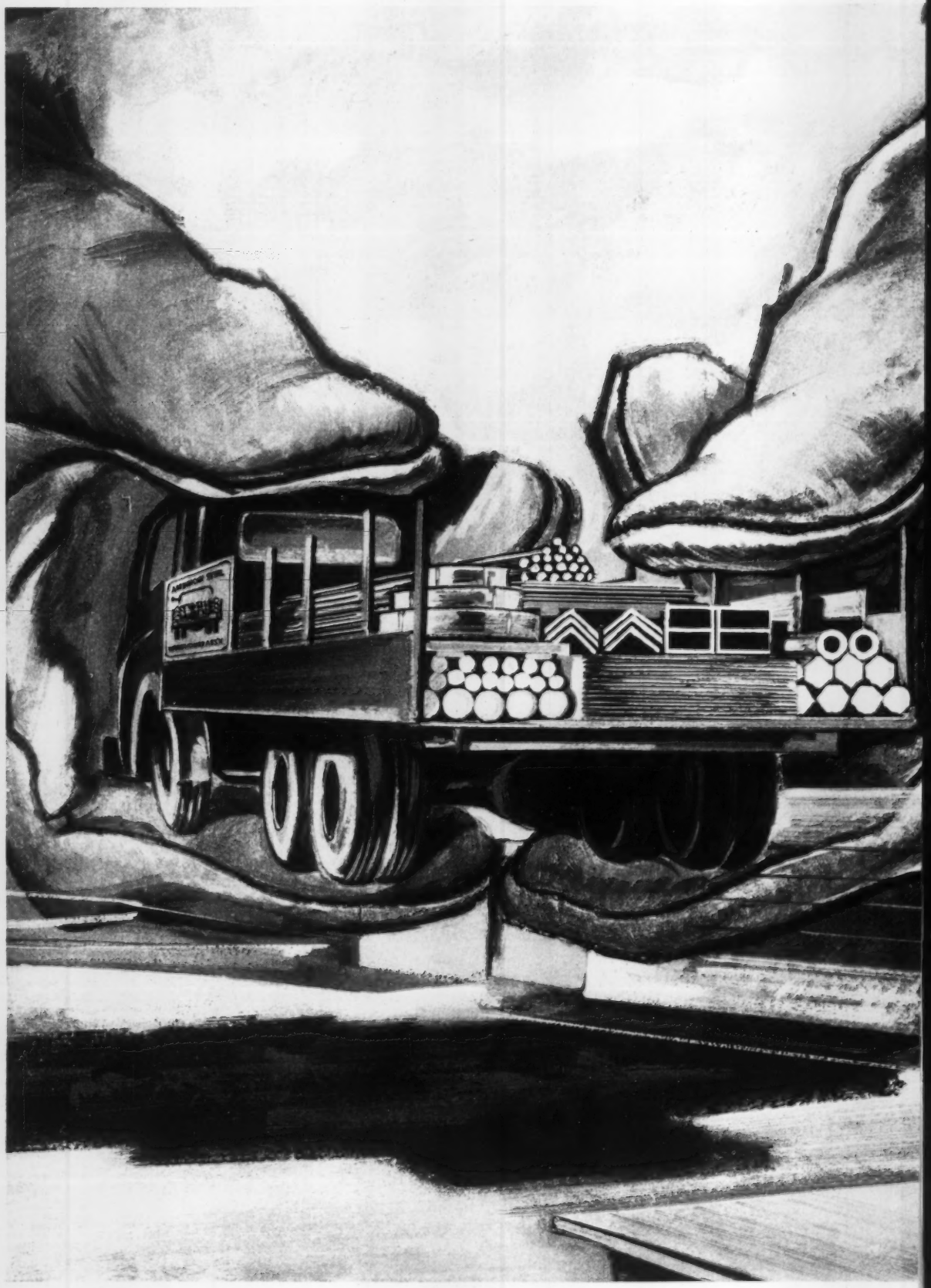
Hot rolled strip is further reduced to gages as thin as 0.010" in this Bliss 4-high 8" & 28" x 24" reversing cold mill.

BLISS
SINCE 1857

100 years of making metal work for mankind

E. W. BLISS COMPANY, Rolling Mill Division, Salem, Ohio

Subsidiary: The Matteson Equipment Company, Inc., Poland, Ohio



What we <u>really</u> deliver to Steel Buyers is

ADDED PRODUCTION EFFICIENCY

Added production efficiency . . . that's what you're *really* getting when you order from your nearby Steel Service Center.

You're buying MORE than steel . . . shaped or cut as you want it. You're buying *production continuity* . . . the ability to keep jobs moving on schedule. Prompt deliveries from local warehouse stocks make this possible.

You're avoiding costly emergencies . . . caused by shortages of critical materials in your plant or on your construction job. Emergencies that could result in lost contracts, plant shutdowns, idle production time, labor layoffs.

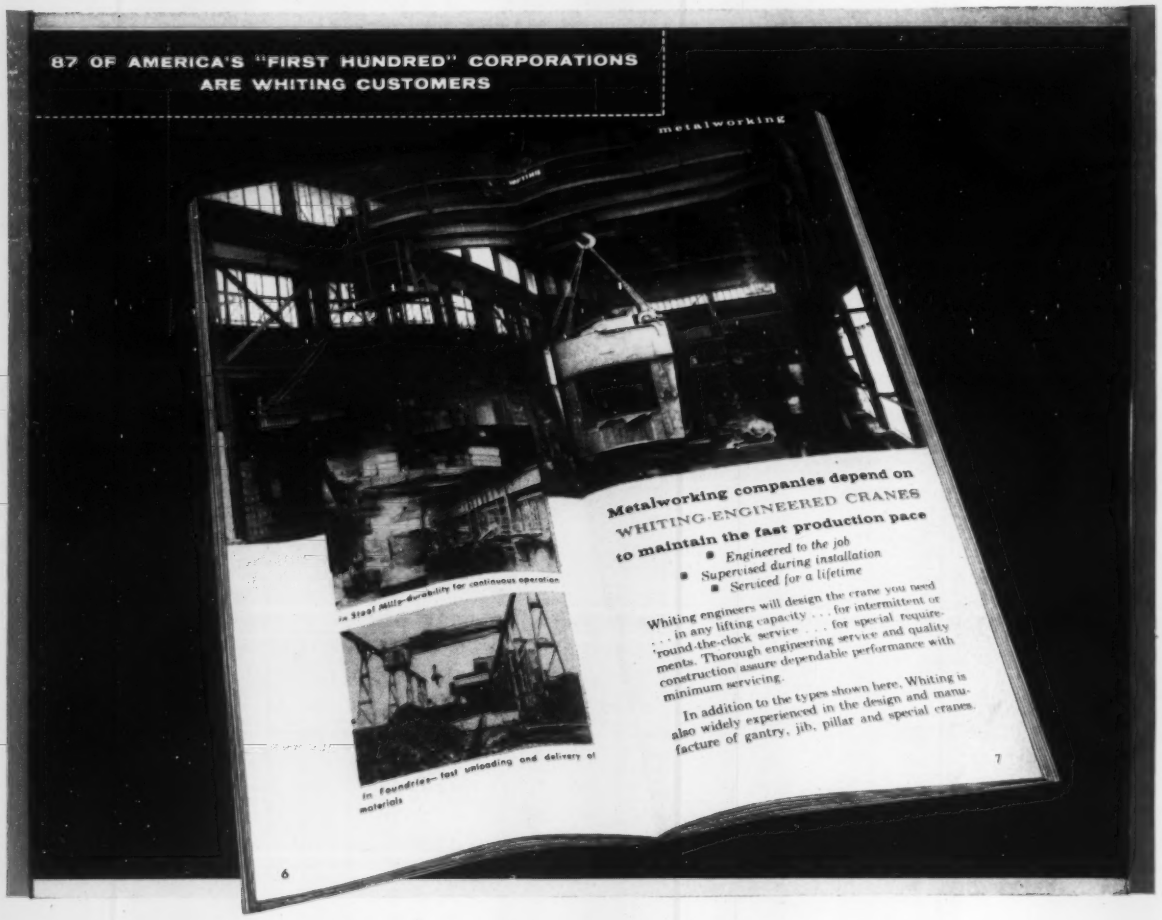
Measure the cost of your purchases from Steel Service Centers in these terms. Weigh them against the much higher costs you'd face if their diversified steel stocks and efficient cutting and handling services were *unavailable* to you!

Call in the representative of your Steel Service Center—a vital segment of America's steel distribution system. Get his practical suggestions on how you can make the *most productive use* of his diversified stocks, modern facilities and services. American Steel Warehouse Association, Inc., 540 Terminal Tower, Cleveland 13, O.

A Coast-to-Coast Network of Steel Service Centers serves North American industry . . . by maintaining diversified steel stocks and modern cutting equipment. Each is specifically set up to meet the needs of its immediate area.

AMERICAN STEEL WAREHOUSE ASS'N

YOUR STEEL SERVICE CENTER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Whiting engineers will design the crane you need . . . in any lifting capacity . . . for intermittent or 'round-the-clock service . . . for special requirements. Thorough engineering service and quality construction assure dependable performance with minimum servicing.
In addition to the types shown here, Whiting is also widely experienced in the design and manufacture of gantry, jib, pillar and special cranes.
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7

Looking for the crane that costs least to maintain?

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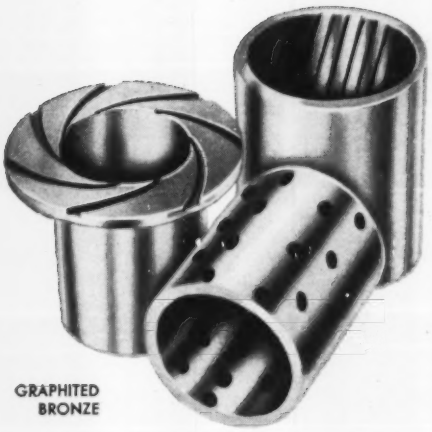
Here's the booklet that shows and tells you why Whiting Cranes last longer and require less service . . . why they're the choice for heavy handling in every industry. The advantages of different types of Whiting Cranes are highlighted—and on-the-job photographs shown.

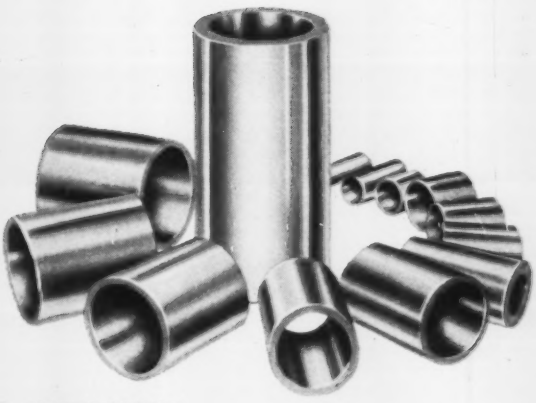
Here, too, you will find valuable information on flexible, efficient Trambeam Overhead Handling Systems . . . on Trackmobile, the road-to-rail convertible that streamlines freight car handling . . . and on *all* the Whiting products that can improve methods and build profits for your company. This 32-page booklet is titled "Working for Profit" and we have a copy ready for you. Write for it today! *Whiting Corporation, 15643 Lathrop Avenue Harvey, Illinois*

WHITING CRANES

MANUFACTURERS OF CRANES, TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES; FOUNDRY, RAILROAD AND CHEMICAL PROCESSING EQUIPMENT

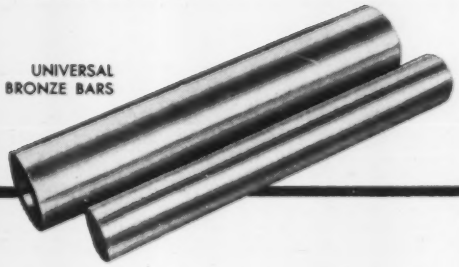


GRAPHITED BRONZE



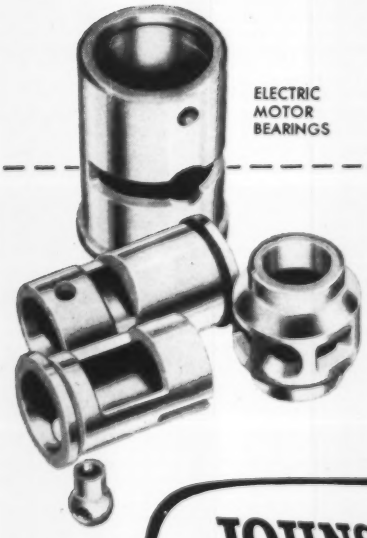
GENERAL PURPOSE

UNIVERSAL BRONZE BARS



LEDALOYL SELF-LUBRICATING

ELECTRIC MOTOR BEARINGS



Over 2300 types and sizes of bearings and bars in stock

Johnson Bronze can supply over 1900 sizes and types of sleeve bearings, and over 400 sizes of bronze bars from stock. This includes standard stock GP bearings, graphited bearings, Ledaloyl self-lubricating bearings, and electric motor bearings made to motor specifications. You can select an economical standard bearing for almost any application from this large stock. For complete details on how Johnson Bronze stock bearings can save you money, contact your Johnson distributor.

JOHNSON Bearings

Johnson Bronze

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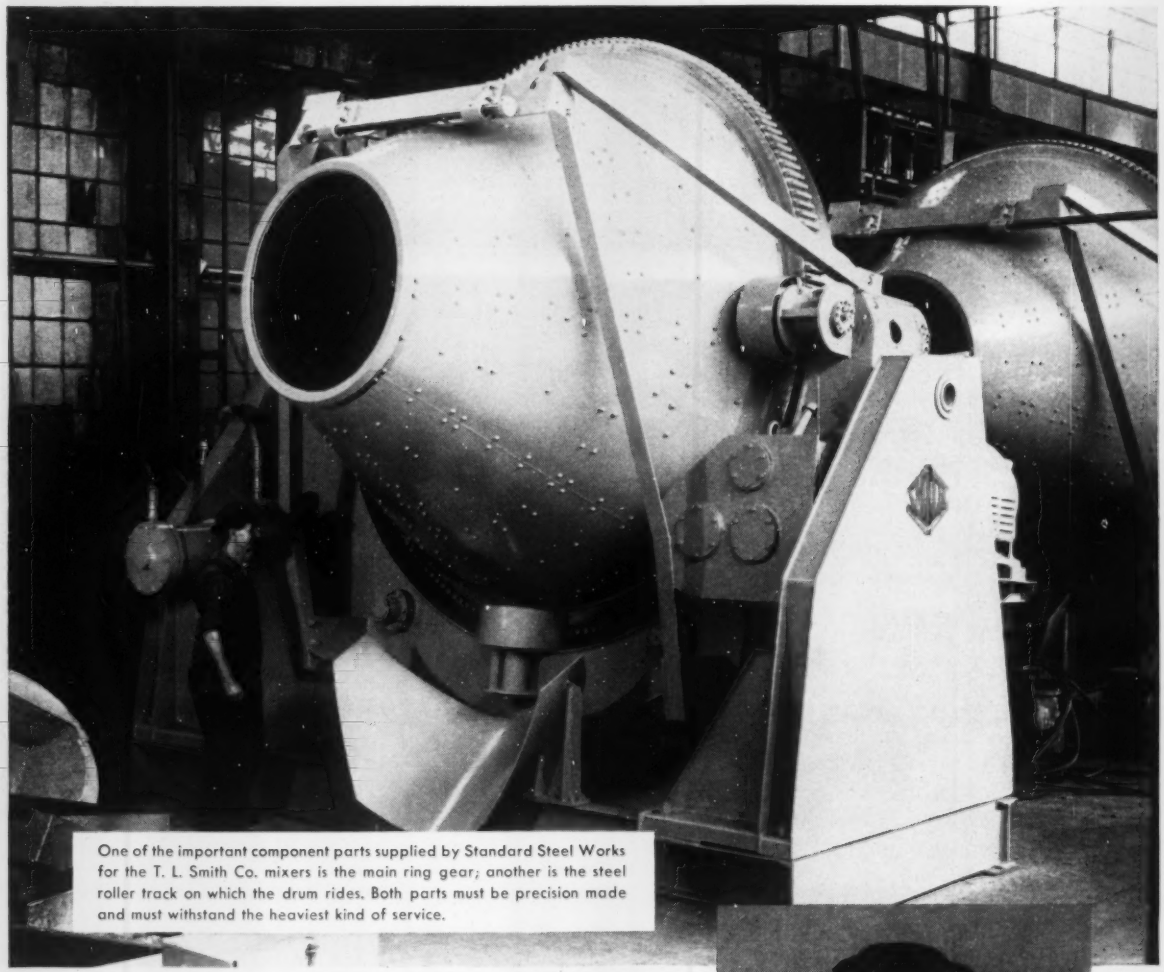

One of the important component parts supplied by Standard Steel Works for the T. L. Smith Co. mixers is the main ring gear; another is the steel roller track on which the drum rides. Both parts must be precision made and must withstand the heaviest kind of service.

"The T. L. Smith Co. is constantly seeking design improvements and production economies. Standard Steel Works has proved a big help to us in both respects."

As suppliers of component parts to the T. L. Smith Co.—world's oldest and largest manufacturer of concrete mixers—we have made it *our* business to get to know *their* business well enough to consider ourselves a part of their team.

It is our policy to work in the closest possible cooperation with all of our customers to assure maximum quality at lowest possible cost. Let us discuss your casting and forging needs with you. You'll find that service to our customers is as important as the quality of the products we make. Write Dept. 2-K.

"We are particularly impressed with Standard's methods-people and the way their engineers so effectively supplement our own in constantly suggesting design improvements and production economies," says R. R. Kupfer, purchasing agent for the T. L. Smith Co., Milwaukee, Wis.

Standard Steel Works Division

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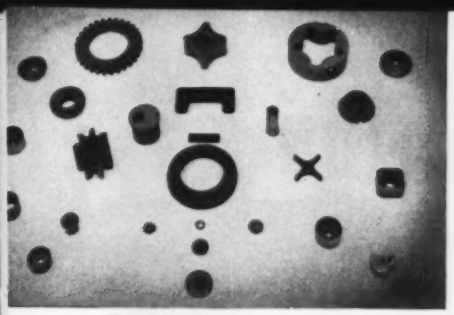
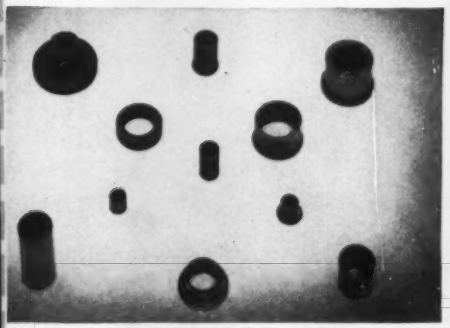
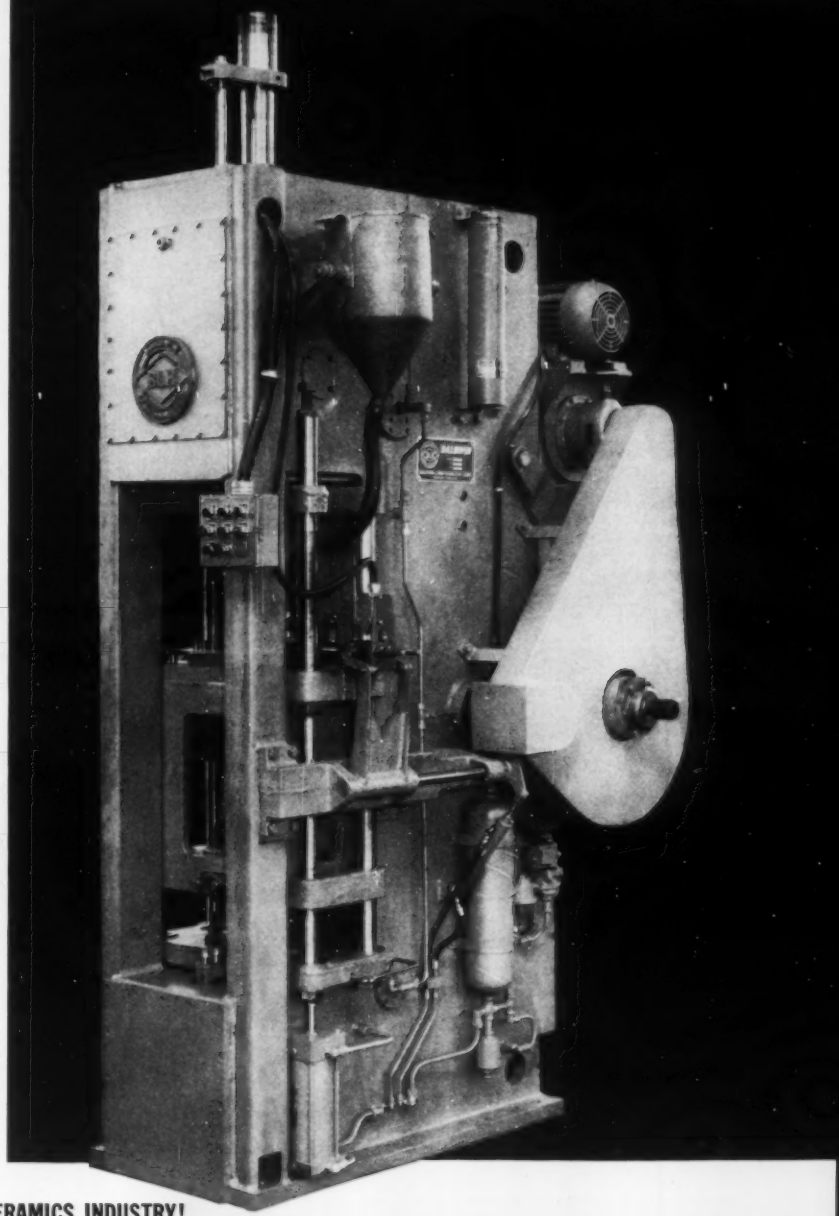


Fabricated parts and gears formed on Baldwin Compacting Presses.



Typical straight and flanged powdered metal bushings made on Baldwin Compacting Presses.

Other parts being made at United States Graphite on Baldwin presses. The double hub and counterbored parts are test pieces. Others are production items.



ATTENTION POWDERED METALS AND CERAMICS INDUSTRY!

Baldwin's new, low-cost compacting press specifically designed to meet your needs

Baldwin-Lima-Hamilton Corporation's 100 years' experience and know-how in designing and building hydraulic presses has been incorporated into the new 50W low-cost compacting press.

Its 1-piece frame and floating die deliver the same uniform pressure, the same rigid 4-point guiding, as our regular heavy duty 4-column hydraulic presses. The 50W is designed for versatility—extra motions may be added as requirements become more complex, without the need for additional machining.

Rated pressure of the Baldwin Model 50W is 50 tons, with a 25-ton ejection capacity. Stroke is adjustable through its entire fill range of 0 to 4½ in. For complete details, including specifications, write to the Hamilton Division, B-L-H Corporation, Hamilton, Ohio.

Hamilton Division Hamilton, Ohio

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BALDWIN BLH LIMA-HAMILTON

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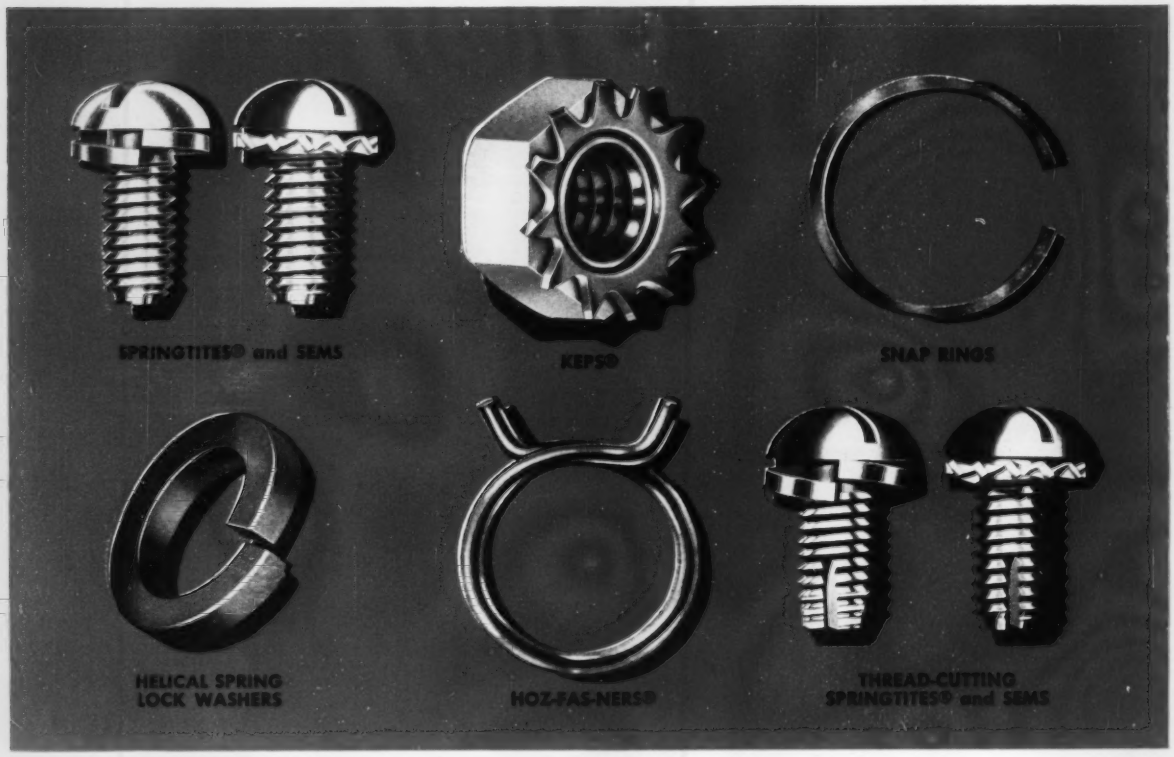

USE EATON-RELIANCE COST REDUCING INDUSTRIAL FASTENERS

Eaton-Reliance Industrial Fasteners are designed on the basis of time-tested principles . . . but in line with the modern concept of helping industry speed production, cut costs and improve quality.

SPRINGTITES and SEMS—preassembled screws and washers eliminate expensive hand operations.

KEPS—preassembled nuts and serrated washers.

SNAP RINGS—take the place of shoulders machined on shafts and in counterbores—save man hours and material.

HELICAL SPRING LOCK WASHERS—keep tension on assemblies despite thread wear, bolt stretch or expansion and contraction.

HOZ-FAS-NERS—quickly applied to make firm connections on rubber, plastic or fabric hose.

THREAD-CUTTING SPRINGTITES and SEMS—seat firmly, reduce chance of mismating or stripping.

For more than forty-five years the Reliance Division of Eaton Manufacturing Company has been designing and producing quality fasteners for industry. You are invited to use this experience to help solve your own problems. Detailed information is included in your free copy of Engineering Bulletin 4K/3. Just send for it, or ask for a visit from one of our fastening engineers.

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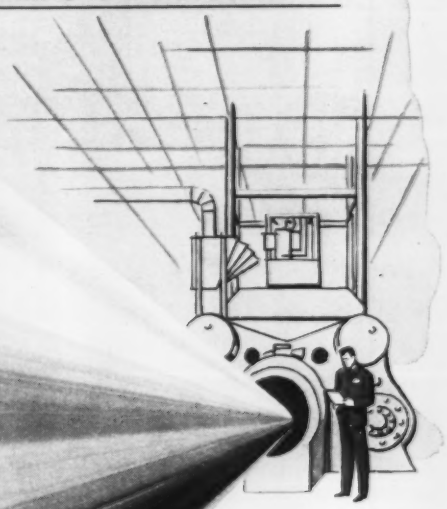
FOR YEARS OF PIPE ECONOMY...



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PROTECTS

against severest heat, pressure and corrosion

Here is High Integrity pipe for the toughest applications in the power, petroleum, chemical and other industries. Extruded from any ferrous alloy in lengths up to 50 feet or more, and with virtually any wall thickness, this pipe from the Curtiss-Wright Metals Processing Division provides increased on-the-job life, long-term economy, elimination of down time – not just for months, but for years to come. Extruded to specification under tremendous one-push pressures from the Division's giant 12,000-ton horizontal steel extrusion press, Curtiss-Wright Heavy Wall Pipe is of uniform high strength and has high resistance to pressure, heat and corrosion. Write today for information on both your standard and special requirements.

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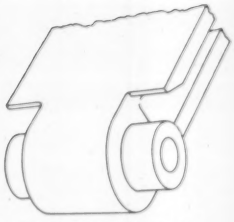
SPECIFY HEAVY-DUTY THERMALLOY* CONVEYOR BELT

Designed by Electro-Alloys to eliminate the "crank-shafting" caused by extreme temperatures and heavy loading conditions. Short integral cast pin allows the link to adjust itself and transfer the load of the belt evenly to the rest of the links. Cast pin is approximately twice as strong in shear as the ordinary wrought alloy bar—and so designed that the bending stress is definitely lower than can be expected from the cast link of a conventional belt.

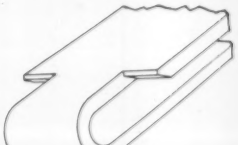


Typical heavy-duty link with cast pin.

FOR LIGHTER PARTS, SPECIFY THERMALLOY GENERAL PURPOSE

A loop-type casting design, suitable for general heat-treat applications in industry. Available in either 3″ or 4″ pitch. The 3″ pitch is a light-duty general-purpose belt, weighing 17 lbs. per sq. ft. The 4″ pitch is primarily designed for intermediate loads of somewhat larger parts, and weighs 21 lbs. per sq. ft.

*Reg. U. S. Pat. Off.



Typical 3″ or 4″ pitch center link of loop-type casting design.

WRITE FOR BULLETIN T-241

. . . giving additional design and application information on both Heavy-Duty and General-Purpose Thermalloy Conveyor Belts. Address: Electro-Alloys Division, 80410 Taylor St., Elyria, Ohio.

AMERICAN Brake Shoe COMPANY

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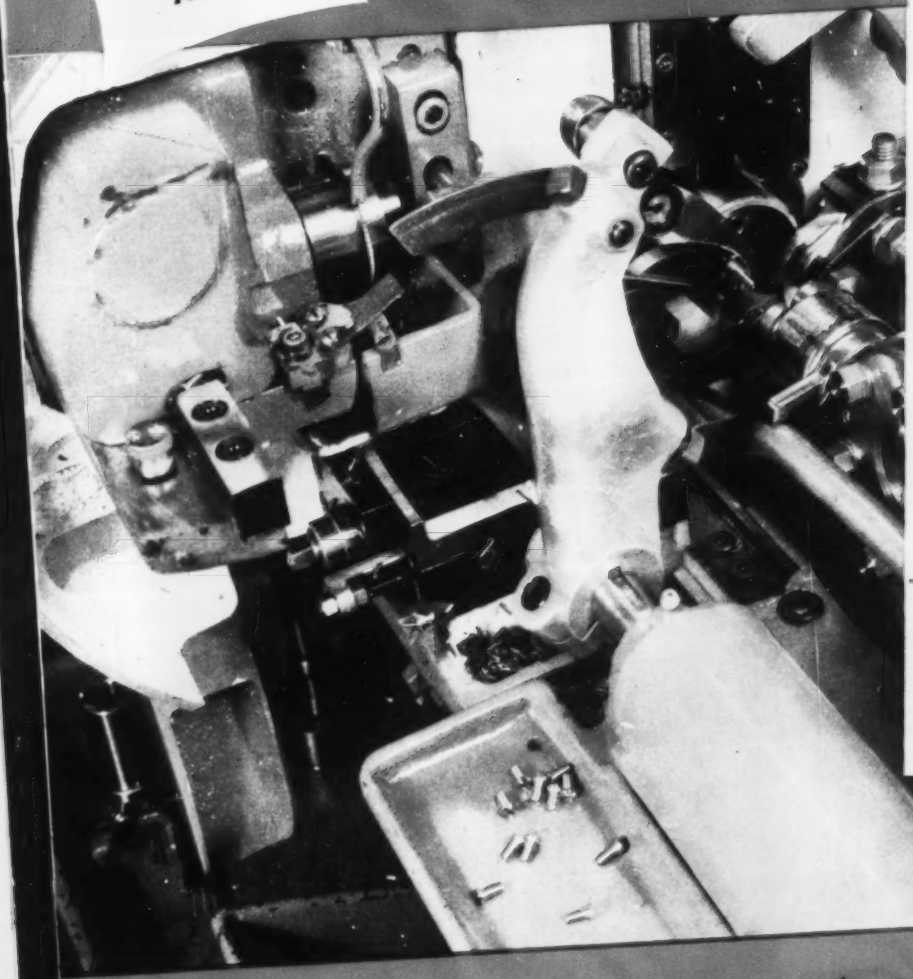
BSA Single Spindle Automatic SPEEDS PRODUCTION of



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5/16-in. long, 6-32 brass machine screw with slotted head produced at the rate of one every 1-1/4 seconds (48 per minute).

Petcock valve body machined from 7/16-in. square steel stock — turned, formed, two threads, and tapped — total time, 26 seconds.

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B.S.A. single spindle automatics are designed for a wide latitude of machining operations with standard attachments. Thus maximum operating flexibility is maintained at all times to insure trouble-free continuous high volume output. Productive capacity includes those parts that require the most intricate automatic machining.

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Built in 5 sizes—rated capacities, 1/2-in. to 2-in.; For general specifications, write for Bulletin B.S.A.-54.

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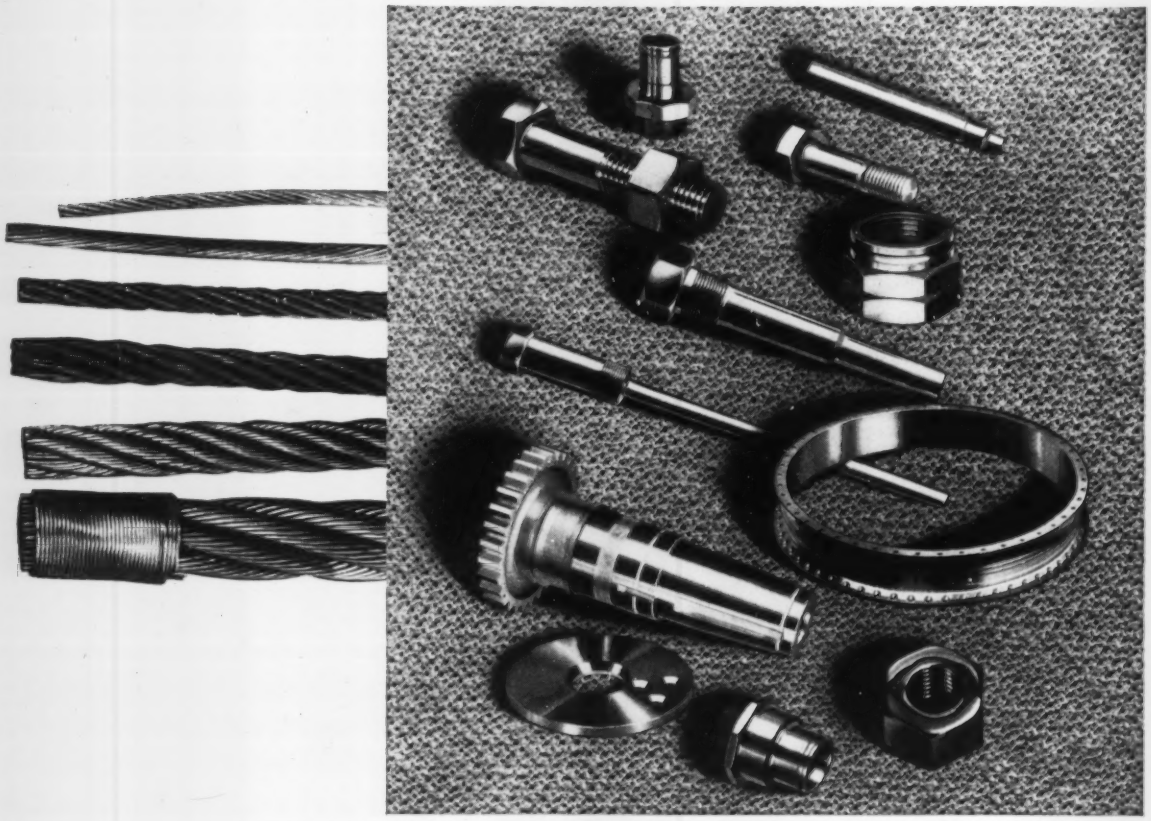

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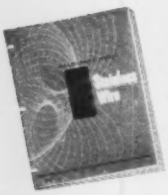

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Illustrated 20 page booklet, which fully describes analyses, physical properties, corrosion resistance, principal uses and applications of stainless wire.

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NCG®

DUAL SHIELD*

The DUAL SHIELD process is something *new* in welding, something dramatically *new*, something dramatically *better!* It's the new welding process that takes the guesswork and mistakes out of welding by *automatic* control. The proper arc voltage is maintained automatically. The electrode is fed to the work automatically. The weld is automatically protected from contamination, both during deposition and during cooling.

Weldors praise the DUAL SHIELD process; they can do better work faster and with less effort and strain. Welding shops like DUAL SHIELD; it not only cuts costs and avoids waste, it often opens entirely new opportunities for welded construction. Buyers of DUAL SHIELD welded products like them because of the cleaner, neater welds. Read what users of the DUAL SHIELD process say. Try this process on your work. You too will be an enthusiast.

PLEASE TURN THE PAGE.....

NCG® DUAL SHIELD*

(the new automatic process everybody likes)

WELDING

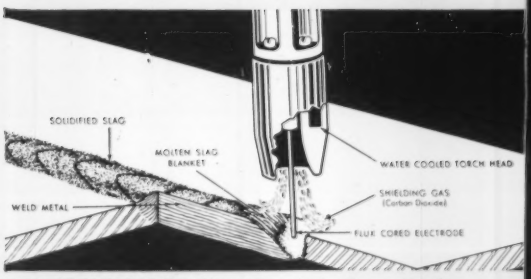
Science takes the guesswork out of welding with the NCG DUAL SHIELD process. Now, better welds are produced continuously because electrode feed and current density are set and held automatically . . . and because the weld is *completely* protected from atmospheric contamination, not only during deposition but during cooling as well.

In NCG DUAL SHIELD welding, inexpensive carbon dioxide gas is automatically fed to the arc to blanket and prevent contamination of the weld. The special flux-cored electrode is fed automatically and continuously from a reel. The flux is never in the way, never hides the weld. The DUAL SHIELD flux-cored electrode affords *absolute control of the amount of flux in the arc.* This is important in order to maintain accurate control of weld chemistry and assure a metallurgically uniform weld deposit. The slag "pops" off as the molten weld metal cools, and the weld can be easily cleaned with a wire brush.

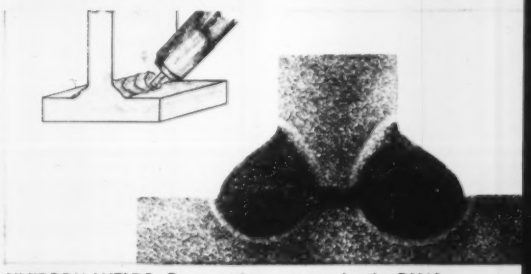
The DUAL SHIELD process is designed primarily for welding all plain carbon steels up to .35% carbon content and type T-1 and A202 steels. It can be used for single-pass welds in the horizontal and flat positions on thicknesses from 3/32" to 1/2". In addition, it is possible to make 1/4" fillet welds at more than 20 ipm and butt welds on 1/4" plate at more than 30 ipm . . . all continuously for foot after foot of exceptionally high quality weld. And, with the DUAL SHIELD process, no cleaning preparation is necessary for welding scaly, oily or rusty steel. The material is cleaned automatically as it is welded.

AUTOMATIC or AUTOMANUAL*

The DUAL SHIELD process is accomplished with the NCG Sureweld welding equipment. The basic Sureweld Type SA-1 outfit is for "Automanual" welding. It consists of electronic welding control, electrode drive, welding gun, and the gas and water cable assemblies. Conversion kits enable you to easily convert this to fully automatic welding. The DUAL SHIELD process makes fully automatic production welding most feasible. It is only necessary to traverse the gun or the work mechanically.



DOUBLE PROTECTION: Flux in the electrode core and a shield of CO_2 work hand-in-hand to produce sound, uniform and clean welds.



UNIFORM WELDS: Once settings are made, the DUAL SHIELD process makes smooth, uniform welds even on scaly, oily or rusty steel.

DEEP PENETRATION: A process feature is its ability to make one-pass welds in mild steel up to ½-in. thick.

NOW . . .
New DUAL SHIELD Welding Bulletin

Just off the press . . . the completely new explanatory literature Bulletin NH-137. Get all the facts . . . complete and detailed description of the equipment and the process . . . case histories . . . all clearly illustrated. Use the coupon or write . . .

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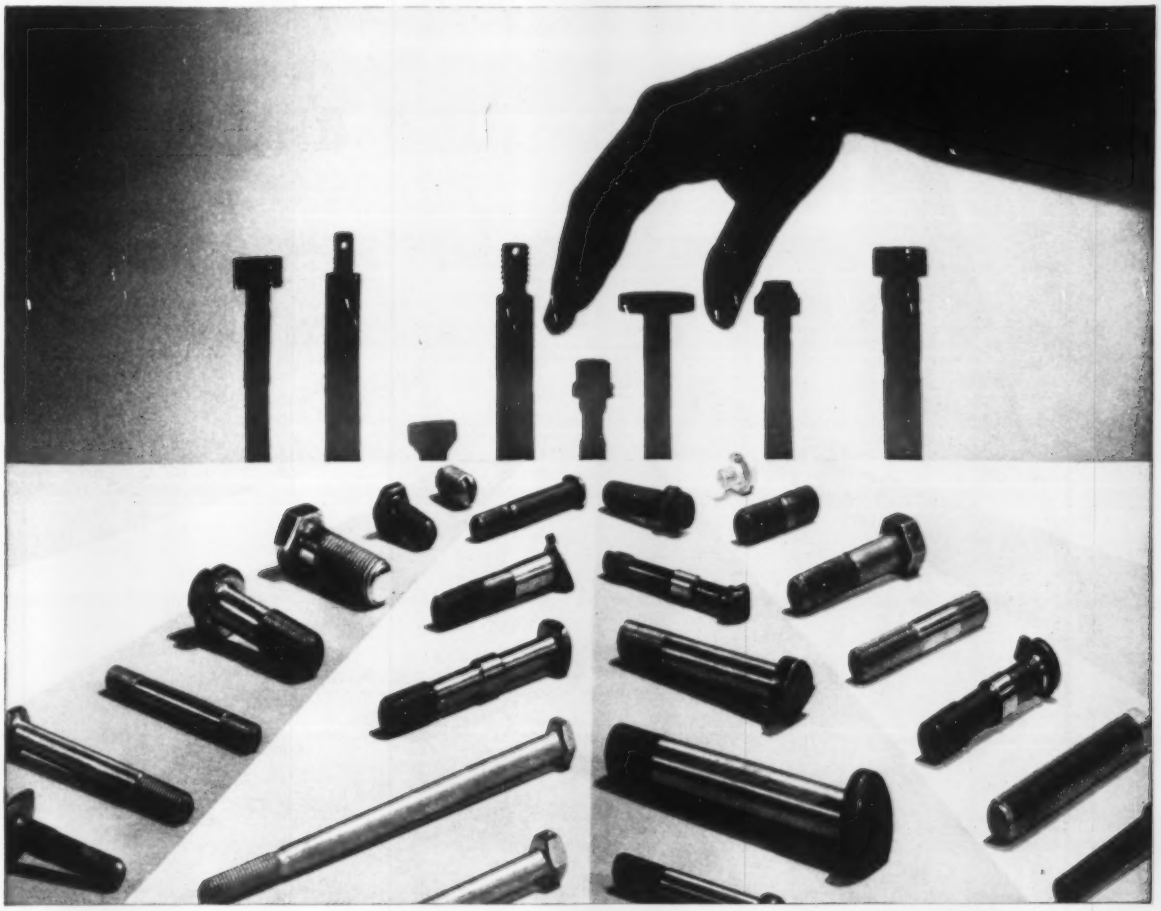

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Often we can suggest a fastener of special shape that will reduce your over-all product costs. Sometimes these special screws eliminate parts, replace more expensive parts, or reduce assembly time. Frequently they improve product performance. In all cases, Ferry Cap customers get the benefit.

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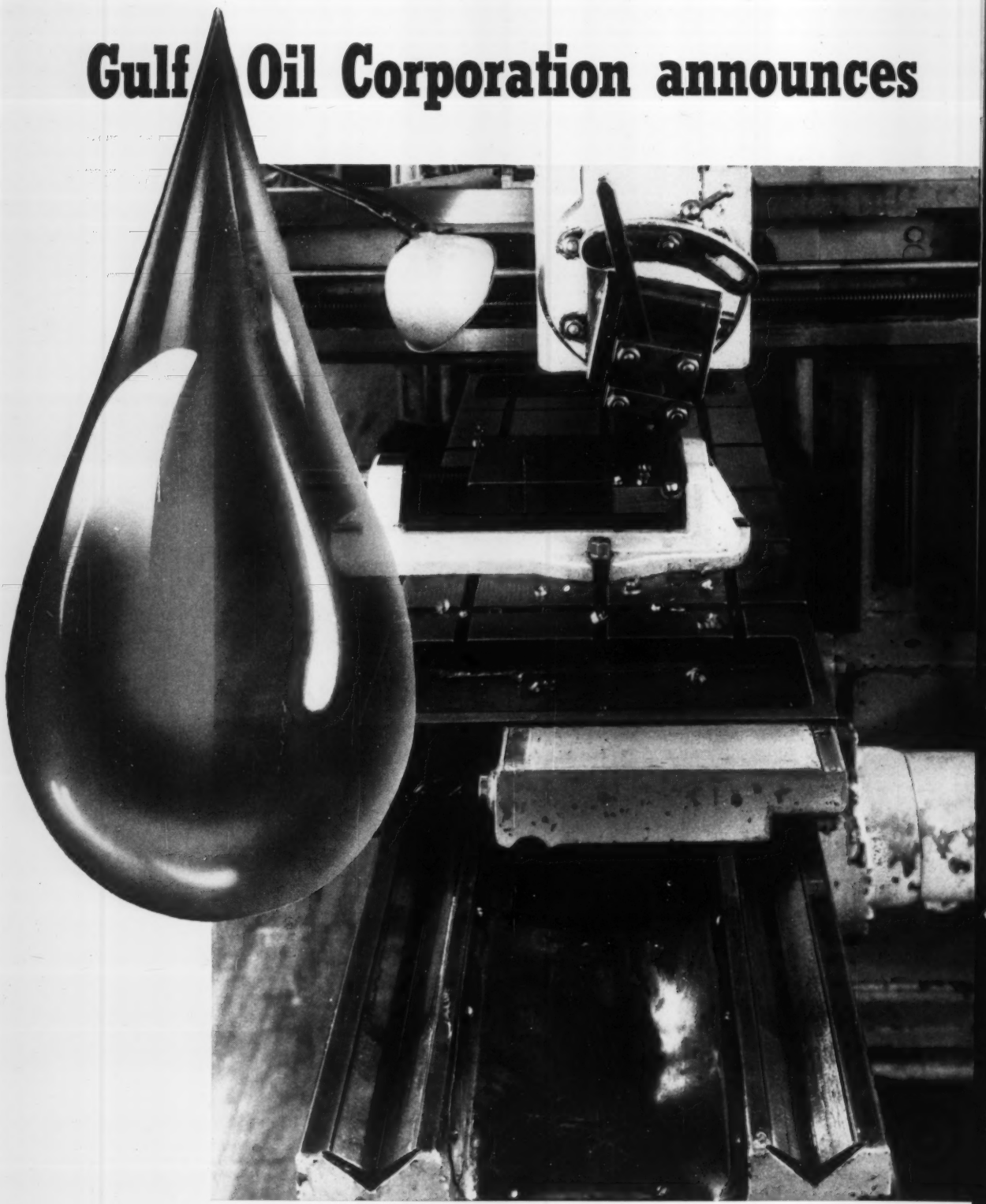
Gulf Oil Corporation announces



Gulfway meets machine tool manufacturers' specifications as a way lubricant and hydraulic medium for grinders, milling machines, planers and boring machines, lathes and other machine tools.

GULFWAY

new three-purpose oil for smoother operation of machine tools

AS A WAY LUBRICANT

Gulfway forms an exceptionally slippery and tenacious film on slides and ways. Its inherent high oiliness is bolstered by a tackiness agent that keeps it sticking to metal. Gulfway will not squeeze out when the table is at rest for long periods. It contains a special low-shear additive that maintains lubricity when clearances are tight or loads are excessive. Gulfway eliminates "stick-slip" chattering that shortens tool life and causes excessive wear of the ways.

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Gulfway will not plug hydraulic lines and controls, or cause pumps to work erratically. It flows freely at all times, even after long periods of dormancy—needs no run-in or warm up and places no strain on pump or motor.

AS A BEARING AND GEAR OIL

Gulfway's characteristic oiliness and high load-bearing capacity make it an ideal lubricant for machine tool gears and bearings. Its long service stability provides an extra margin of economy.

Gulfway is available in two different viscosities. Why not make this new oil prove itself in one or more of *your* machines? Contact your nearest Gulf office, or write to:

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GULF OIL CORPORATION
Department DM, Gulf Building
Pittsburgh 30, Pennsylvania

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

Which of ENTHONE's metal-finishing developments do you need?

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- ☐ ENAMEL STRIPPERS—A wide variety of strippers are maintained "in stock". In addition, Enthone will be glad to study your requirements and develop the precise stripper you need to meet your requirements.
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Remember — your metal finishing problem is our business! Since Enthone has been studying these problems, and developing their solutions, for 20 years, chances are we have the answer to your problem in stock. On the other hand, if yours is an unusual requirement, we will be glad to study your needs and develop the precise chemical for the purpose. Just send us a letter, outlining the problem or process—and enclose a sample of the metal concerned, if possible.

Write to Dept. S-11.

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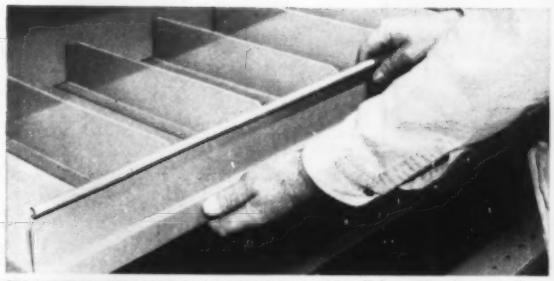
Only New HALLOWELL *ERECTOMATIC*® Steel Shelving

cuts assembly time, permits fast repositioning of shelves —gives you these plus features

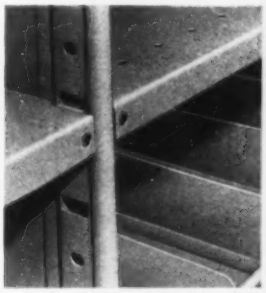


STRAIGHT-IN, STRAIGHT-OUT SHELF CHANGE. No tilting. No dismantling. No interference with any other shelf.

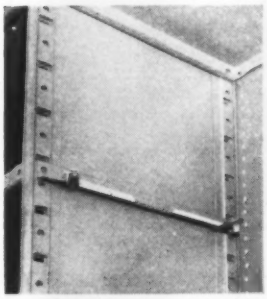
INDEPENDENT SHELF POSITIONING. Each shelf can be repositioned individually in seconds.

FULL USE OF SHELF AREA. No tees or angles, and beaded posts save valuable space.

COMMON SIDE PANELS AND POSTS save material between adjacent units in a rack. Back and side panels are one-piece.



BEADED POSTS AND FLANGED SHELVES prevent snagging of clothing or stored goods, protect workers.

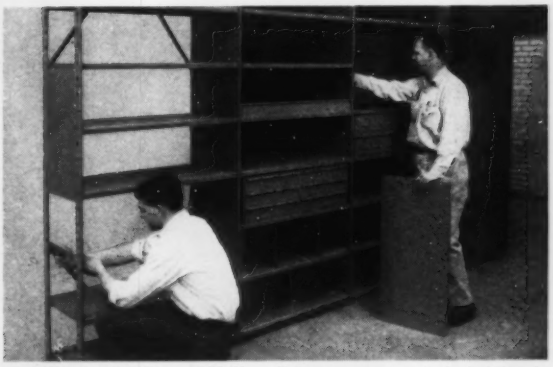


FULL DEPTH SHELF SUPPORT. No buckling possible. Reinforcements can be added when required.

4 CLASSES OF SHELVES. Regular, medium, heavy and extra-heavy construction meets all load requirements.

No matter what type of shelving you need—open, closed, bin units, ledge units, counters or cabinets—new Hallowell ERECTOMATIC® steel shelving makes the job easy. The unique built-in locking device*—developed by SPS—speeds assembly and rearrangement of shelves. To position a shelf, slide it into place on the shelf supports, press the locks, and the shelf is locked. To reposition a shelf, release the locks, pull the shelf straight out, slide it straight in on its supports at the new location, and press the locks. It takes only seconds to do the complete job. Made of prime steel, phosphate coated, and finished in SPS green baked-on enamel—other colors are available. Hallowell ERECTOMATIC steel shelving is stocked by leading industrial distributors and shop equipment dealers. For complete information, see the one nearest you. Or write Hallowell Shop Equipment Division, STANDARD PRESSED STEEL CO., Jenkintown 33, Pa.

*Patent applied for



TWO MEN ASSEMBLED new Hallowell ERECTOMATIC steel shelving in just over 10 minutes. Closed unit was 36 in. wide, 18 in. deep, 7 ft. 3 in. high, complete with seven shelves. Standard models of other design required 13-55 min. Table shows test results.

Brand	Time to Assemble (Min.)	Units Per Hour
Erectomatic	10.42	5.75
A	13.23	4.53
B	14.24	4.21
C	16.30	3.68
D	18.12	3.31
E	25.03	2.40
F	55.03	1.09

HALLOWELL® SHOP EQUIPMENT DIVISION

STANDARD PRESSED STEEL CO.

SPS

JENKINTOWN PENNSYLVANIA

STONE
MODEL T-20

"Slices" THROUGH STAINLESS STEEL

STONE MODEL T-20

Traverse Cutting Machine pictured at Rolled Alloys Plant, South River, N. J.

●

The patented revolutionary type of stainless sealed-roller ways preloaded, permit long, continuous, trouble-free operation. Has a totally enclosed heavy-duty floating type steel safety guard, parallel work stop gauge and positive clamping device.

This new Stone Model T-20 Traverse-Type Cutting Machine cuts one-inch stainless steel at approximately 3 feet per minute.

The Stone T-20 cuts ferrous, non-ferrous and non-metallic sheet and plate.

CLEAN CUTTING . . . HIGH SPEED . . . ACCURATE

The new Stone T-20 Model is the result of more than three years of engineering. It's the most versatile and rigid completely-hydraulic-operated traverse-type machine on the market today. Each feature of the T-20 is designed for speed and accuracy *with* safety. Hydraulic lateral feed 0-50′ speed per minute. The speed of raise and lower of cutting head is from 0-10′ per minute. Length of cut 12′ with raise and lower 24″.

SPECIFICATIONS STONE MODEL T-20

Capacity: 4″ ferrous or 8″ non-ferrous depending on material. Consult our engineers.
Size: 21′ x 8′ x 8′
Weight: 12,000 to 14,000 lbs.
Arbor Speed: 2360 RPM (others from 630 to 2900)
Actual Cutting Times: 1″ x 10′—3 min., 45 sec.
¾″ x 5′—1 min., 15 sec.
Full 20 H.P. geared-in-head, T.E.F.C., induction type, continuous duty motor
Wheel Diameters: 20″ x .150 to .170 (Larger diameters upon request)
Arbor Size: 1¾″
Heavy Duty 8″ steel wheel flanges. Cuts with an abrasive wheel on ferrous metals; steel saw blade with oil mist spray on non-ferrous.

Write for more information

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the RIGHT SIZE and SHAPE...

in welded steel tubing

What size do you need? Standard produces welded tubing in a vast range of sizes and grades—stainless, carbon and low alloy. What shape do you need? Standard produces it in round, square, rectangulars, and a host of special shapes. Maybe you have a design problem? The specialists at Standard are anxious to work with you. Whether your requirements call for structural, mechanical, or pressure tubing, Standard produces them to your specifications.

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MULTIPRESS

boosts carbon core production 33% at CLEVELAND GRAPHITE BRONZE

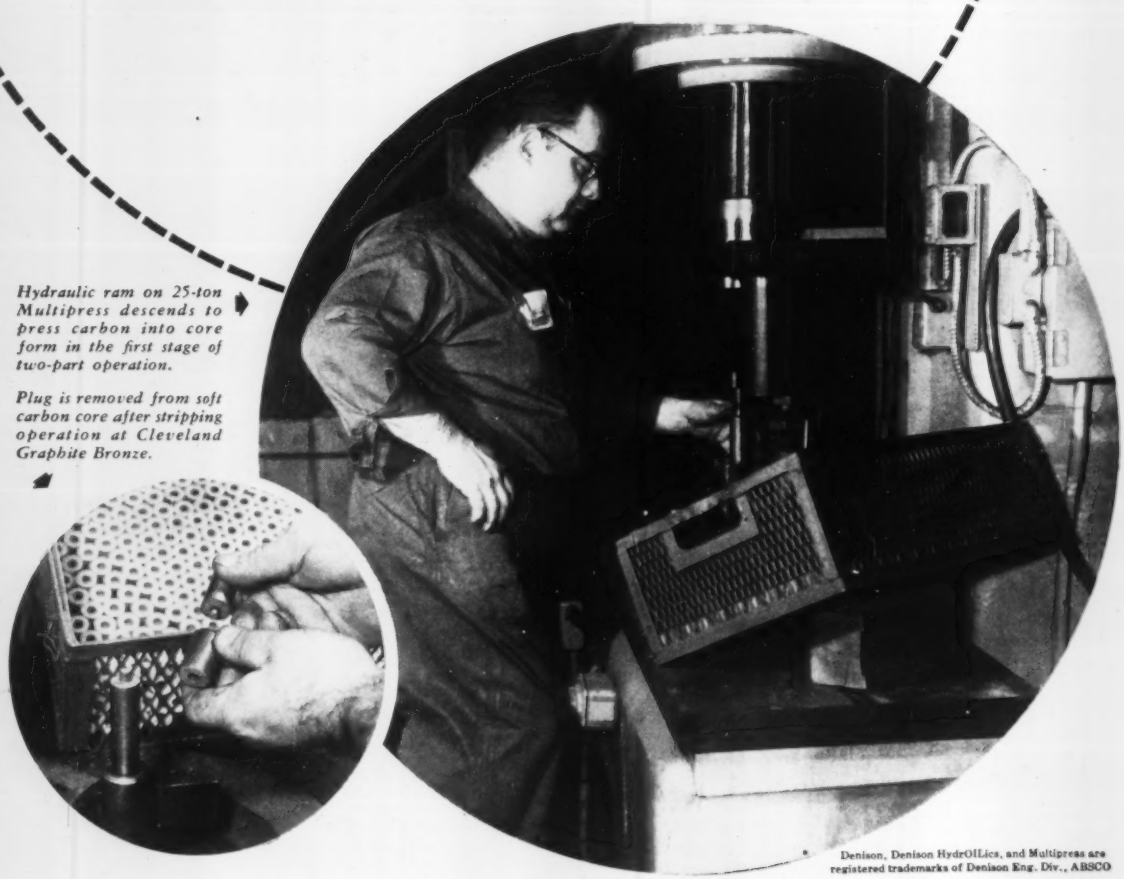
Cleveland Graphite Bronze has increased the production of soft carbon cores for aircraft bearing castings by 33% using a 25-ton Denison hydraulic Multipress.

Machining cores to shape, the best alternative method, can be done at the rate of 70-75 per hour. With Multipress, 100 cores are formed in the same period. Soft carbon at one-tenth the cost can be used instead of the hard carbon required in a machining operation.

Datalog COM-3 describes this operation in detail. For your copy, write Denison Engineering Division, American Brake Shoe Co., 1180 Dublin Road, Columbus 16, Ohio.

DENISON HydrOILics

HYDRAULIC PRESSES • PUMPS MOTORS • CONTROLS



Hydraulic ram on 25-ton Multipress descends to press carbon into core form in the first stage of two-part operation.

Plug is removed from soft carbon core after stripping operation at Cleveland Graphite Bronze.

Denison, Denison HydrOILics, and Multipress are registered trademarks of Denison Eng. Div., ABSCO

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SIMONDS ABRASIVE CO.

GRINDING WHEELS

with NEW IL BOND

Hailed by industry as a major grinding wheel improvement new IL bond acts as an internal lubricant in the wheel providing the fast cutting action of a softer grade, plus the long wear of a hard wheel. For rough snagging on swing frame, floor stands and portable grinders. Write for snagging bulletin ESA 62.

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Division of Simonds Saw and Steel Co.

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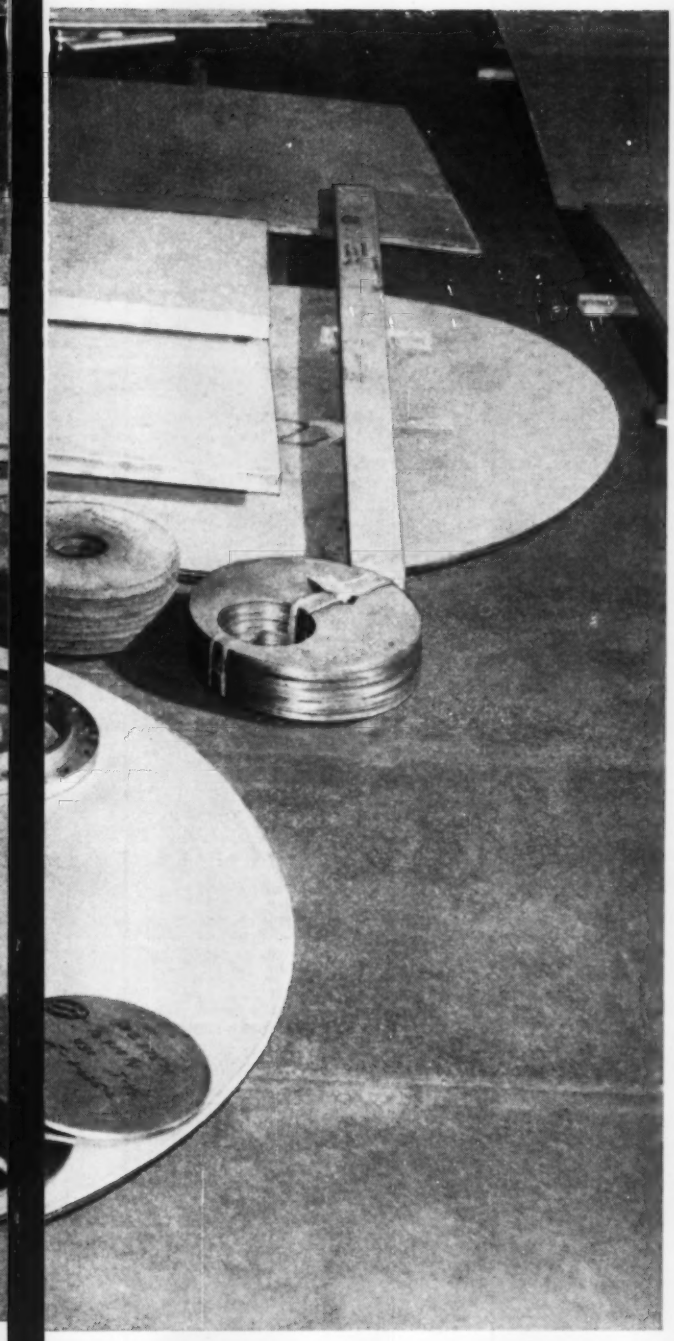

Check your drawings and you may find that you require all of the stainless steel items shown here—plates, heads, tube sheets, discs, forgings, flanges, rings, special patterns, bars, and sheets (#1 Finish) in the heavier gauges. When you buy all these material components from one source you save time, effort and money.

Your assembly costs are kept to a minimum when you use Carlson's abrasive cut material. Cleaner edges mean less true-up time on the job. There is no heat-affected zone because little heat is developed during the cutting. Fabrication is easier and the finished product is of the highest quality, more dependable in use.

Who pays freight on "offcuts" you can't use? No one, when you use Carlson's service for cutting plate to shape, ready for your fabrication. Plate is sheared, sawed, flame or abrasive cut and machined to your specifications. Eliminating freight charges on excess material lowers your costs.

There's the matter of delivery which also means time and money to you. As specialists in stainless steels, Carlson has the diversified equipment and the technical and practical knowledge to produce the plate or shapes you want, the way you want them with delivery as promised.

Stainless Steels Exclusively

G. O. CARLSON Inc.

THORNDALE, PENNSYLVANIA

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DISCS • FORGINGS • FLANGES • BARS AND SHEETS (No. 1 Finish)

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NEW CONCEPTS OF ECONOMY

VERSATILE ACIPCO *Centrifugally Spun* STEEL TUBES

In all types of industry, versatile Acipco centrifugally spun tubing is giving the design engineer greater freedom. Furnished with the exact combination of physical, chemical and metallurgical properties required by design, manufacturing and service conditions, high quality Acipco tubing helps create both new dimensions in design and new concepts of economy.

If you design, manufacture, or use parts requiring tubular metal stock as a component, an investigation of the versatility of Acipco tubing and the flexibility of Acipco's integrated facilities for spinning, heat treating, machining, fabricating and testing will be worth your while.

Your nearest distributor will gladly furnish helpful information about Acipco tube applications in your field, as well as useful technical data and assistance.

SIZE RANGE: Lengths up to 16′— longer lengths by welding tubes together. OD's from 2.25″ to 50″; wall thicknesses from .25″ to 4″.

ANALYSES: All alloy grades in steel and cast iron, including heat and corrosion resistant stainless steels; plain carbon steels and special non-standard analyses.

FURNISHED: As cast, rough machined, or finish machined, including honing.

COMPLETE FACILITIES

SPINNING
Acipco Steel Tubes are centrifugally spun to exact physical and metallurgical specifications. The exact size and metal analysis your process or project requires is assured.

FABRICATION
Complete, integrated facilities for machining, welding, finishing and heat treating of tubular parts save shipping time and expense for Acipco customers.

TESTING
Facilities for both hydrostatic and air testing, as well as for other physical and chemical analyses and tests, are available as part of complete Acipco steel tube service.

INSPECTION
Expert inspection, including radiography, during all phases of production, helps keep Acipco steel tube quality high.

TECHNICAL ASSISTANCE
A staff of highly trained engineers, metallurgists, chemists and craftsmen serves the designer and manufacturer who specify Acipco Steel Tubes.

MEET US AT BOOTH 1376, METALS SHOW, NOV. 4-8, CHICAGO

DISTRIBUTORS

Austin-Hastings Co., Inc.
226 Binney St.
Cambridge 42, Mass.

Peter A. Frasse and Co., Inc.
17 Grand St.
New York 13, N. Y.

Lyman Tube & Bearings, Ltd.
920 Ste. Sophie Lane
Montreal 3, Canada

Vinson Steel & Aluminum Co.
4606 Singleton Blvd.
Dallas 7, Texas

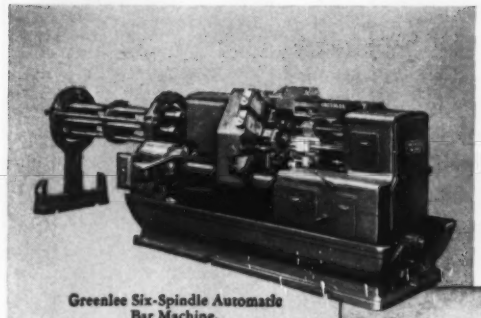
J. M. Tull Metal & Supply Co.
285 Marietta St., N.W.
Atlanta, Ga.

C. A. Roberts Company
2401 Twenty-fifth Avenue
Franklin Park, Ill.

Strong, Carlisle & Hammond Co.
1392 W. Third St.
Cleveland 13, Ohio

Ducommun Metals & Supply Co.
4890 So. Alameda St.
Los Angeles 54, Calif.

AMERICAN CAST IRON PIPE CO.
Special Products Division
BIRMINGHAM 2, ALABAMA

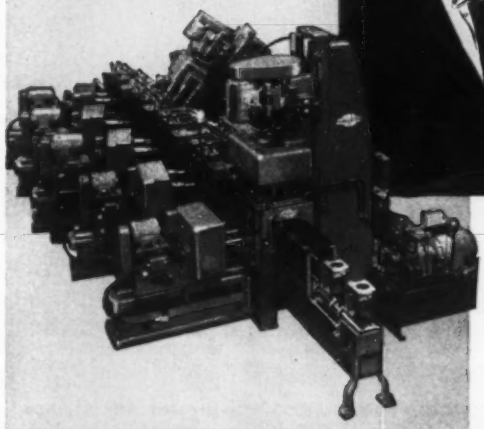


Greenlee Six-Spindle Automatic Bar Machine.

GREENLEE OFFERS

A PROFIT-MAKING INVESTMENT IN HIGH-PRODUCTION MACHINE TOOLS

Greenlee 22-Station Automatic Transfer Machine for machining transmission cases.



Greenlee creative thinking, Greenlee engineering and Greenlee experience combined with that of your own engineers will help you "produce more at lower cost."

Ideas, engineering, experience and facilities of Greenlee Bros. & Co. develop improved methods and machines for greater and greater productivity of future models.

Greenlee's adequate facilities expedite the transition from production ideas to production machines . . . a profit-making investment at work in your plant.

Greenlee 10-Station Automatic Transfer Machine.

GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

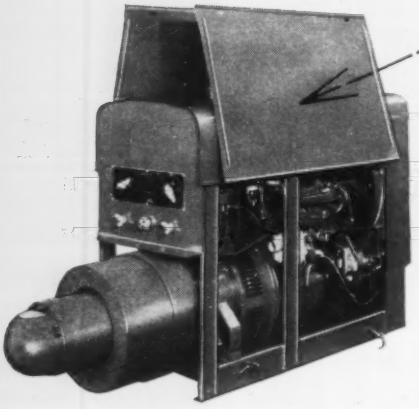
- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines

Write for Further Information

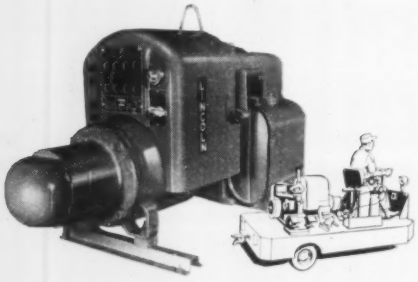
GREENLEE

GREENLEE BROS. & CO.
1930 Mason Ave.
Rockford, Illinois

Mobile maintenance shop has ready-to-use power



Lincoln 200 amp. *"Shield-Arc" Engine-Driven welder. Furnishes 115 volt DC auxiliary power for lights, tools, etc. Write for Bulletin SB-1337.*



Weldanpower—*Compact, lightweight Engine-Driven combination welder and power plant furnishes 200 amps. AC welding current and 115/230 volt AC, 60 cycle power—at the same time if necessary. Write for Bulletin SB-1339.*

There's no lost motion—no waiting for electricians, for special wiring or hook-ups when your maintenance man takes the power he needs to the job. Repairs can be started seconds after your maintenance man arrives on the scene.

Ready-to-use power in the form of a Lincoln Engine-Driven welder mounted on a gasoline powered truck saves as much as 125 man hours per month for one manufacturer. Auxiliary power, standard on all Lincoln Engine-Driven welders, operates tools and lights, and 200 amp. welding current handles welding jobs with ease.

Mobile maintenance shops with Lincoln Engine-Driven welders are saving money for others. Why don't you investigate today?

THE LINCOLN ELECTRIC COMPANY

Dept. 1633 • Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment

When a Lincoln Engine-Driven Welder **Has** Auxiliary Power for Lights and Tools **Yet** can be easily moved from job to job

WHY don't you use a mobile maintenance shop and save money?

TO MEET AND BEAT HIGH PRODUCTION COSTS

compare the blades you're using with STAR

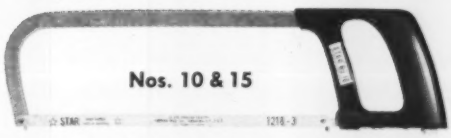
THE STAR BLADES GIVE ALL 5

1. Uniformity in fabrication
2. Proper Hardness
3. Efficient Tooth Design
4. Sufficient Set for Clearance
5. Clearly marked for Ease of Identification

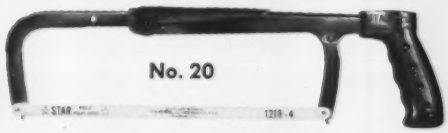
Point 2 OF STAR'S 5 FEATURE CHECKLIST

PROPER HARDNESS

To insure full blade life and economical performance our company has developed over many years unique heat treating equipment that insures not only proper hardness but uniformity.



No. 10 – Green molded handle. Almost indestructible. Shaped for comfort. Patented Lever-Lock positions, tensions blades automatically. **No. 15** – Red molded handle, chrome-plate finish. Same features as No. 10.



Long a favorite with mechanics, this gunmetal finish adjustable pistol-grip frame with lever for lock blade features extra easy blade change.

STAR BLADES

Manufactured by

CLEMSON BROS., Inc., Middletown, N. Y., U. S. A.

Makers of Hand and Power Hacksaw Blades, Frames, Metal and Wood Cutting Band Saw Blades and Clemson Lawn Machines

Clemson Bros., Inc.
Middletown, N.Y., U.S.A.

☐ Please send the STAR Metal Cutting Guide that contains information on blade types, cutting techniques, feeds and speeds and general metal cutting information.

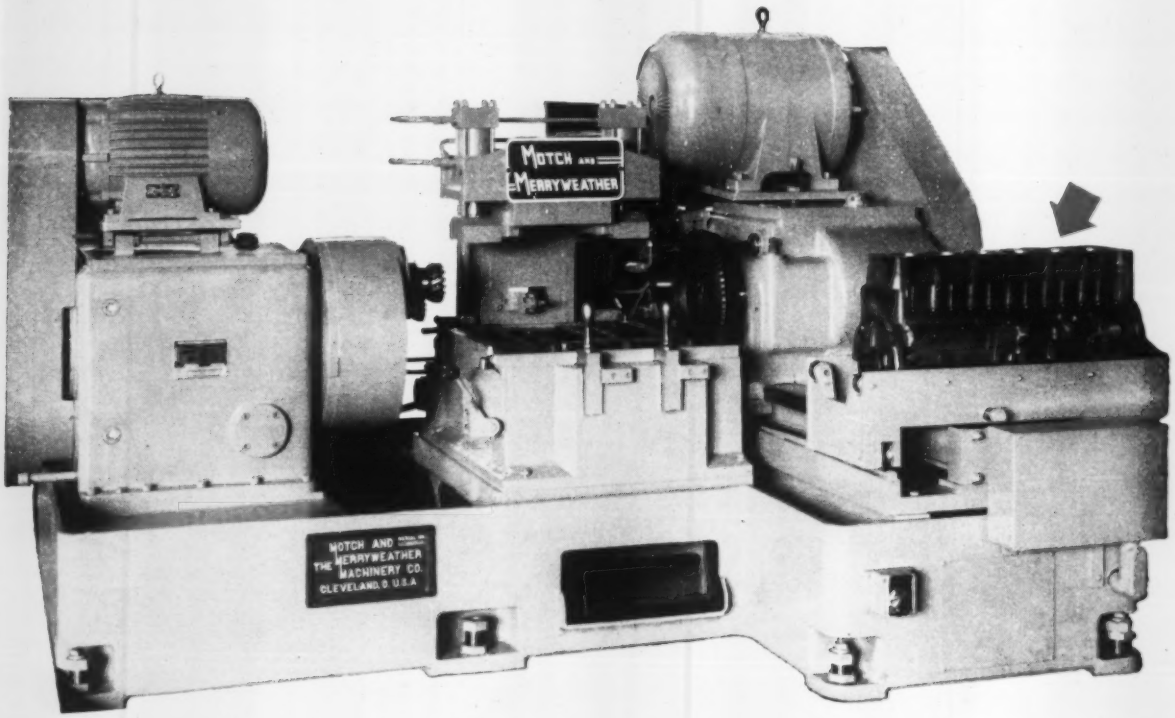
☐ Please send the STAR Metal Cutting Chart—A handy guide for the shop metal worker.

Name_____

Address_____

City_____ Zone____ State____ ⊕ 4864

M&M develops another specialized machine



Special Duplex Milling Machine

more than doubles milling production on cylinder blocks

A prominent automotive manufacturer—comparing this M&M machine with previous equipment used to mill ends of cylinder blocks—reports:

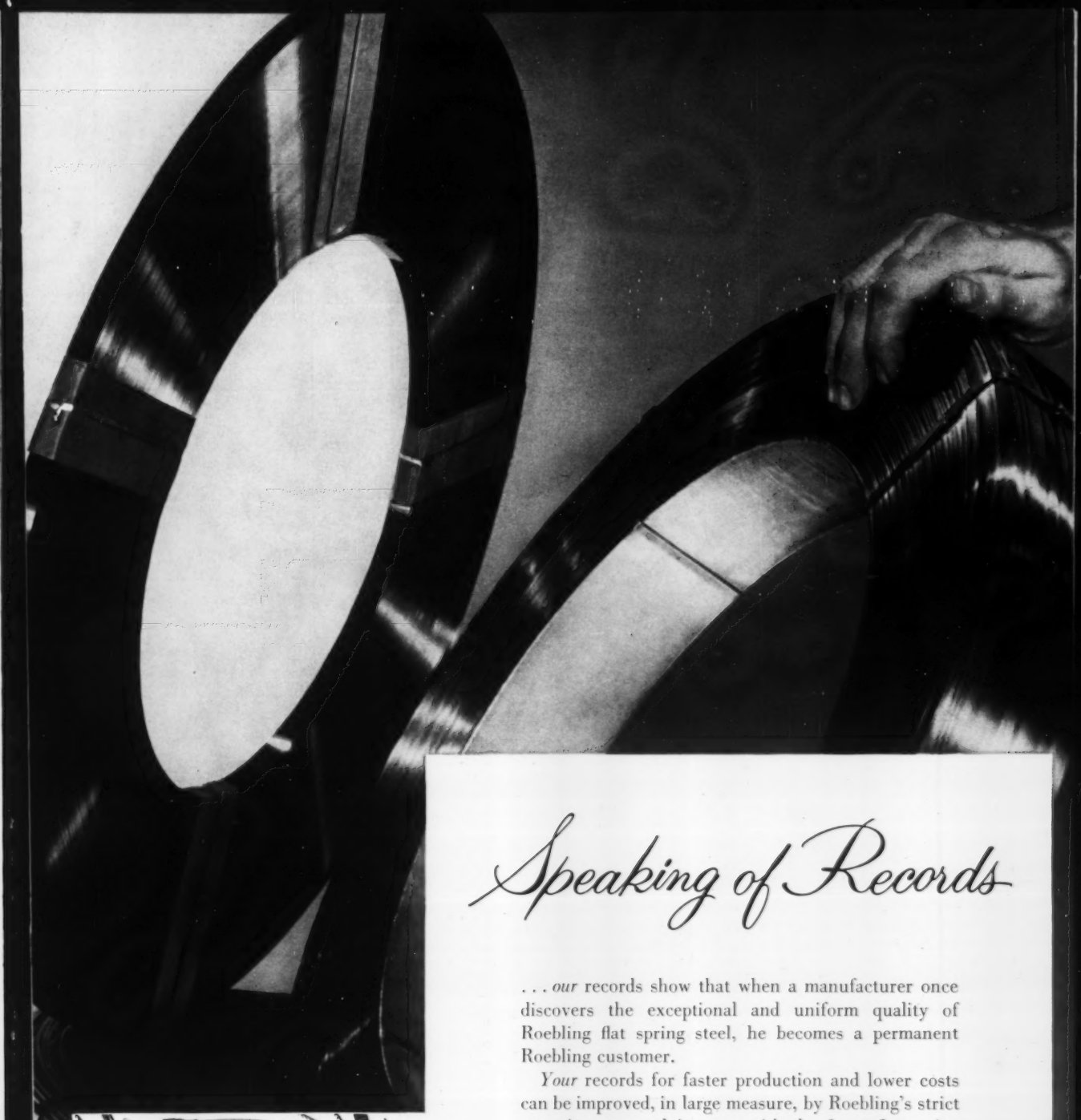
In addition to boosting production from 22 to 50 blocks per hour, this M&M machine has greater strength in planetary milling unit, gives longer cutter life and more accuracy. Its extreme rigidity permits rough and finish operations in one pass of the heads.

An operator positions the block in the fixture where it is automatically clamped. The right hand head feeds across one end of the block while the left hand planetary head profiles the flywheel housing mounting surface. Cutters rapid traverse back, fixture is unclamped and finished block is removed.

Machine Tool Manufacturing Division

MOTCH AND MERRYWEATHER

Cleveland, Ohio



Speaking of Records

. . . *our* records show that when a manufacturer once discovers the exceptional and uniform quality of Roebling flat spring steel, he becomes a permanent Roebling customer.

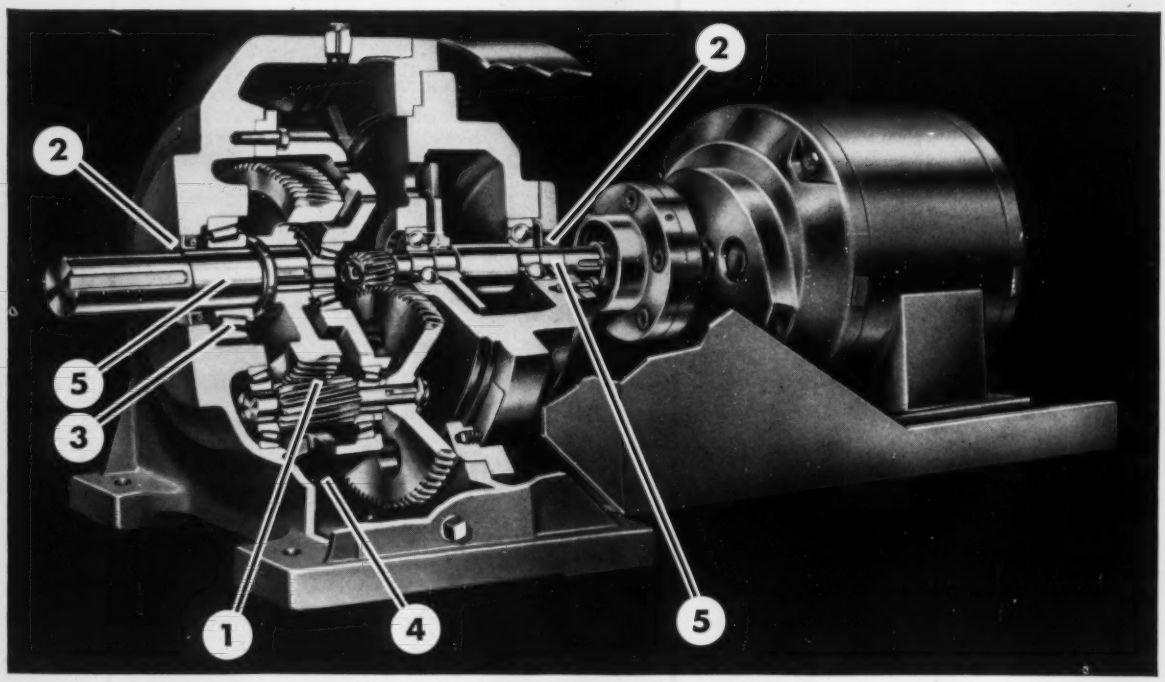
Your records for faster production and lower costs can be improved, in large measure, by Roebling's strict attention to supplying you with the finest flat spring steel available. When you need flat spring steel, specify Roebling. Write Wire and Cold Rolled Steel Products Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

These are typical of the many types of quality parts produced from Roebling flat spring steel.

ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

Roebling... Your Product is Better for it

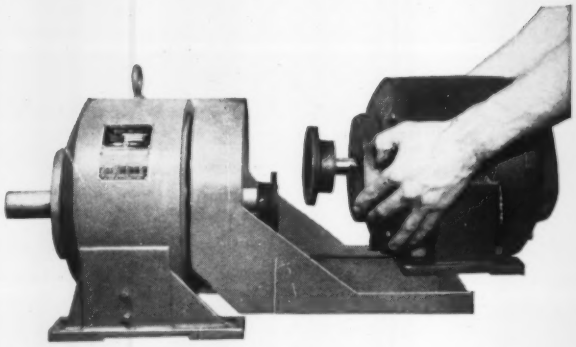


Why Phillie Gear Utility GearMotoRs reduce downtime...motor inventory

The new Philadelphia Utility GearMotoR has already won wide acceptance among plant engineers and designers, because: any standard NEMA foot-mounted motor can be used . . . *without special modifications for shaft, flange or supporting devices.* Here is a packaged power drive, ideal for use where flange-mounted motors are a supply problem. You can utilize readily available or existing foot-mounted motors immediately, because of the integral motor mounting base. This new Utility GearMotoR substantially reduces machinery downtime for motor changeover or replacement. Simply remove bolts securing motor feet, separate shaft coupling . . . lift motor off . . . and replace . . . all in a few minutes.

Steel motor support is rigidly ribbed to maintain shaft alignment, precision-drilled to receive NEMA motor frame mountings. Save time and money all around. Specify the Philadelphia Utility GearMotoR.

Send for Catalog GM-560 which fully describes and illustrates the new Philadelphia GearMotoRs, Utility GearMotoRs, In-Line Reducers and Motorized Worm Gear Drives.



1. HELICAL GEARING assures silent operation, increased strength, longer life and minimum friction loss. Teeth are crowned shaved and induction hardened for optimum performance.

2. TWO-WAY SEALS lock oil in, and seal dirt out.

3. OVERSIZE THRUST BEARINGS handle big overhung loads.

4. OIL BATH LUBRICATION keeps gears and bearings continually showered with clean oil.

5. HEAVY SHAFTING, heat treated alloy steel, eliminates possibility of bending or twisting under heavy loads.

phillie gear ®

PHILADELPHIA GEAR WORKS, INC.

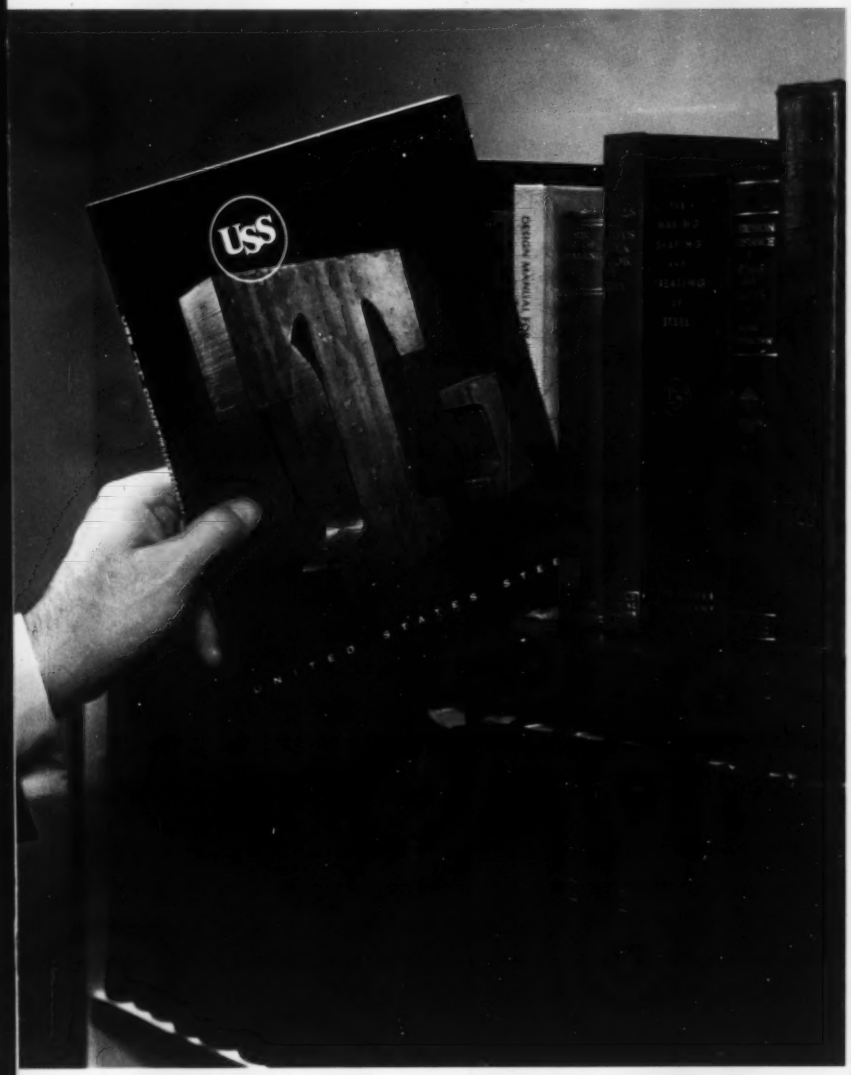
ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.

Offices In all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID MIXERS • FLEXIBLE COUPLINGS

Virginia Gear & Machine Corp. • Lynchburg, Va.

Speaking of technical bibles...



here's one that every engineer should have at his fingertips

Without this excellent book, your technical library isn't complete. If you haven't already received your free copy, by all means send for it now.

In it you'll find everything you want to know about USS "T-1" Constructional Alloy Steel—where to use it, when to use it, how to use it; its engineering properties, metallurgical characteristics, fabrication practices, and dozens of interesting illustrated applications.

USS "T-1" Steel is tomorrow's steel available *today*—the remarkable new alloy steel that is drastically influencing design thinking all along the line. Cutting costs, improving products, building them lighter yet stronger – these are some of the very desirable advantages USS "T-1" Steel offers you.

United States Steel Corporation, Pittsburgh
Columbia-Geneva Steel Division, San Francisco
Tennessee Coal & Iron Division, Fairfield, Ala.
United States Steel Supply Division,
Warehouse Distributors, Coast-to-Coast
United States Steel Export Company, New York

No other steel possesses "T-1" Steel's remarkable combination of high yield strength, toughness and weldability. That's why you can always build it better with USS "T-1" Steel.

USS "T-1" CONSTRUCTIONAL ALLOY STEEL

"USS" and "T-1" are registered trademarks.

RETURN THIS COUPON, NOW!

United States Steel
Room 5659
525 William Penn Place
Pittsburgh 30, Pennsylvania

Please send me a copy of your new booklet, USS "T-1."

NAME AND TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....

UNITED STATES STEEL

Vacuum casting of ingots...

a new technology in production of USS Quality Forgings

76-ton ingot cast to produce a generator rotor forging for Large Steam Turbine-Generator Department, General Electric Company.

THE HIGHEST ART OF STEELMAKING is probably exemplified in forged alloy steel turbine and generator rotors for electric power generating equipment. Many of these rotors operate at high temperatures under heavy loads and are, therefore, subjected to the most rigorous inspection through each step of the manufacturing cycle.

Entrapped gases, especially hydrogen, have been suspected of contributing to undesirable internal discontinuities in these large forgings. There is also evidence that hydrogen is associated with low ductility. Several years of experimenting in our melt shops indicated that relatively low hydrogen levels were possible but not low enough to solve the problem completely. The next step was to provide equipment for casting these gigantic ingots in a vacuum, thus removing the gases at the time of pour.

Tests on our vacuum cast forgings produced to date indicate a hydrogen reduction of more than 80% compared with previous air cast methods. Our casting chamber, where atmospheric pressure is reduced 99.9%, is designed to contain an ingot as large as 95″ in diameter, weighing about 350,000 pounds. The equipment in which these large ingots are cast was specially designed by United States Steel.

This is but one of the many advances in steel technology constantly emerging from the research laboratories and mills of United States Steel.

We are eager to receive your inquiries. Please address them to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS QUALITY FORGINGS

heavy machinery parts . . . carbon, alloy, stainless
forged steel rolls and back-up roll sleeves
electrical and water wheel shafts
specialty forgings of all types

UNITED STATES STEEL

NOTHING can equal Stainless Steel

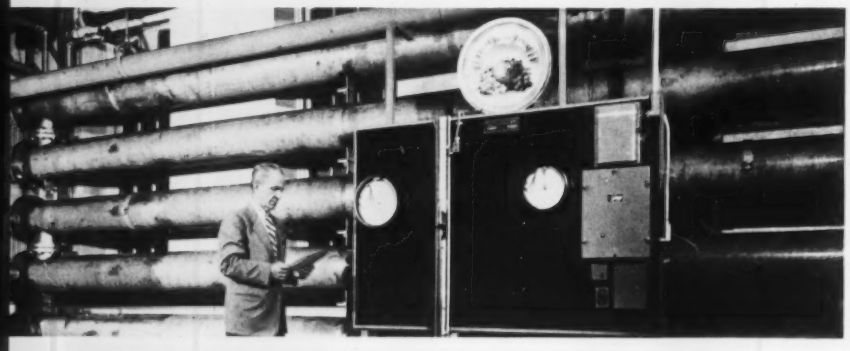
in its unique combination of properties

No other design material can match Stainless Steel in its combination of desirable properties: corrosion resistance, strength, hardness, beauty, cleanability and easy fabrication. For a reliable source of supply, United States Steel offers you the widest range of types, finishes and sizes. **Just call your steel warehouse.**

For Humid Locations. The Richmond Sifter is made by Sprout-Waldron in Muncy, Pa. Unit shown here has two sets of full-size sieves, containing up to 90 square feet of bolting area. Up to six separations can be made from each of the two sections, and two different materials can be spouted to the sifter. Stainless Steel sieves are supplied when humidity or temperature is high—or when corrosive materials must be sifted. Many sifting applications could not be economically handled without the Stainless Steel sieves.

For Permanent Beauty. The Santa Fe made news last year when they announced the revolutionary "El Capitan" train. Cars are 15½ feet high, two feet higher than standard, and they are completely sheathed with beautiful Stainless Steel. And in addition to being a glamour metal, Stainless has the corrosion resistance to assure years of gleaming beauty. One Stainless Steel train has been in service over 20 years, and the exterior is still in perfect condition.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



For Operating Economy. A textile manufacturer found that they could save about $70,000 **yearly** by using waste hot water to pre-heat the incoming fresh process water. Problem: the hot water had a heavy caustic soda content. Solution was a super-efficiency unit purchased from Ludell Manufacturing Company, in Milwaukee. It is made completely from Type 304 Stainless Steel and contains **19,000** lineal feet of tubing inside the shell units. It is doubtful that any other material could have been used under these conditions. Even better, the unit is expected to last indefinitely.

USS STAINLESS STEEL

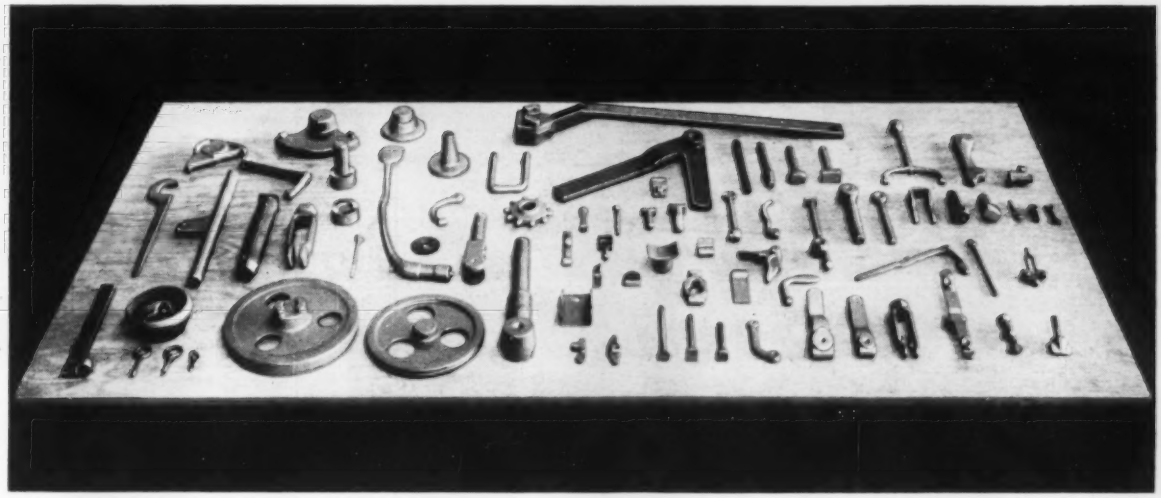
SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

UNITED STATES STEEL

200 Different Parts Heated for Forging-

Better, Faster and at Much Lower Cost

with TOCCO* *Induction Heating*



• When progressive production people at General Railway Signal Company installed a 200 kw, 3000 cycle TOCCO machine, they were able to eliminate 7 slot-type oil-fired furnaces and produce better forgings than ever before—at substantially lower costs.

Cost Down—Fuel costs have been reduced from $15.26 to $1.60 per hour with TOCCO. Expensive furnace lining maintenance has been eliminated, and straightening and reheating operations formerly required are no longer necessary.

With oil-fired furnaces all steam hammer operators needed helpers. With TOCCO most of these helper operations have been eliminated.

TOCCO's fast, automatic operation produces almost no scale and achieves uniform temperatures throughout the entire cross section—improving the quality of the forgings and providing increases of up to 40% in the life of the forging dies.

Overall production costs in the forge shop at G.R.S. have been reduced an impressive 35%!

Flexibility—Production runs at G.R.S. range from a low of 15 pieces to a high of over 50,000. Parts from ½ pound to over 25 pounds are heated, merely by changing inductor coils and power control settings.

Better Working Conditions—TOCCO makes the forge shop a better place to work by doing away with noise, dust, dirt, smoke and radiant heat and gases produced by old fashioned furnaces.

If you're looking for a way to produce similar results in your plant, it will pay you to consult a TOCCO Engineer.

THE OHIO CRANKSHAFT COMPANY

Mail Coupon Today— **NEW FREE Bulletin**

The Ohio Crankshaft Co. • Dept: S-10, **Cleveland 5, Ohio**

Please send copy of "Typical Results of TOCCO Induction Heating for Forming and Forging".

Name_____

Position_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

Behind Every Length of Steel Pipe by WHEATLAND

CONTINUOUS INSPECTION for *QUALITY*

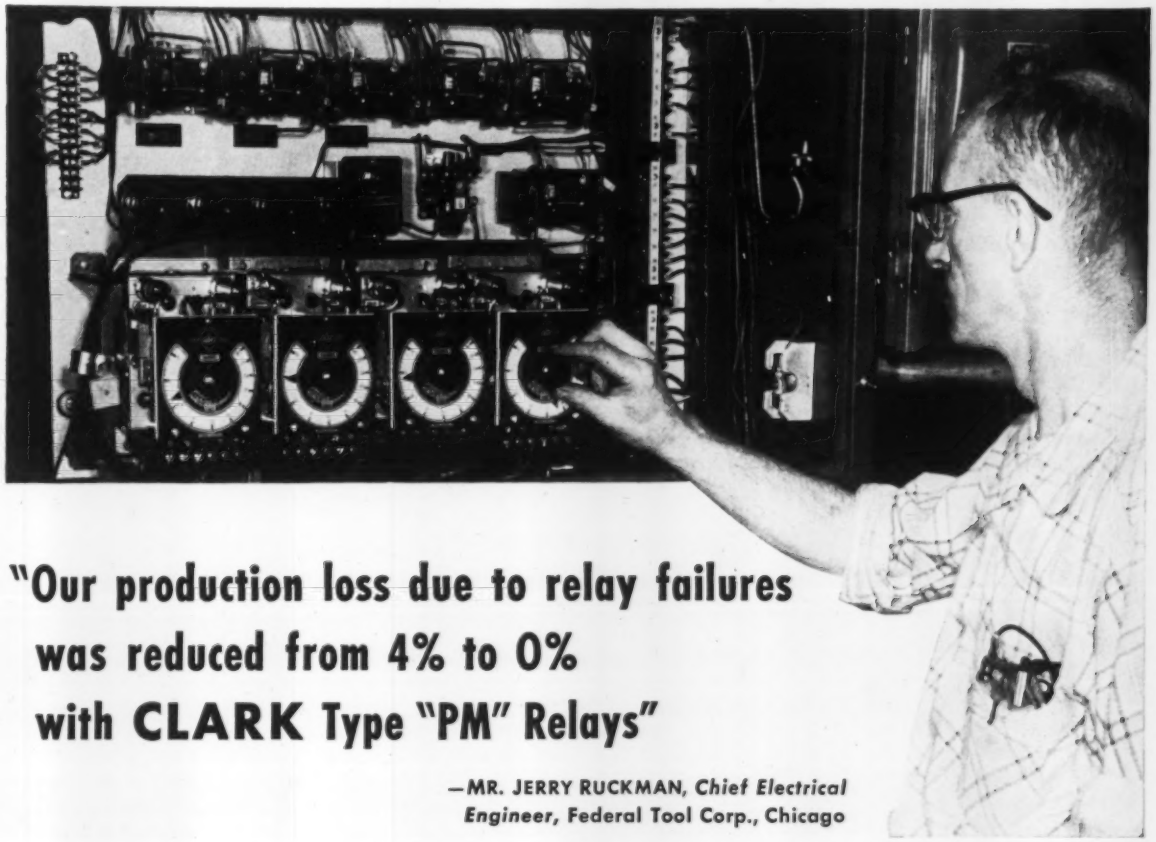
At regular intervals during fabrication, sample pieces of Wheatland Steel Pipe are carefully inspected for quality. This is just one reason why you can recommend and use this fine product with complete confidence. There are other reasons, too . . .

- **Skilled, experienced craftsmen**
- **Rigid pressure-testing**
- **Strict supervision of all phases of production**
- **A trained sales organization**
- **A reputation for quality and service built by the caliber of Wheatland Distributors**
- **The Wheatland Yearmark—lasting reminder of our pride and integrity**

For information about Black or Galvanized Steel Pipe, contact

WHEATLAND TUBE COMPANY

BANKERS SECURITIES BUILDING, PHILADELPHIA 7, PA.
MILLS: WHEATLAND, PA. • DELAIR, N. J.



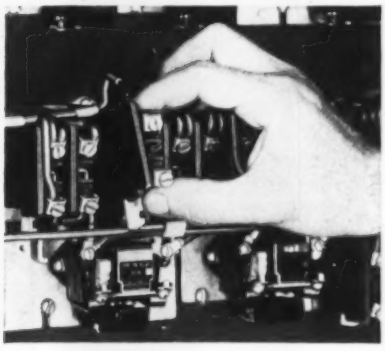
"Our production loss due to relay failures was reduced from 4% to 0% with CLARK Type "PM" Relays"

—MR. JERRY RUCKMAN, *Chief Electrical Engineer*, Federal Tool Corp., Chicago

Explains Chief Engineer Ruckman: "We turn out plastic housewares, haircurlers, toys, premiums and other plastic products by the hundreds of thousands every twenty-four hours. Demand is high. Customers insist on prompt delivery. That's why we were so concerned over the erratic operation of the relays in our molding machine control panels—the heart of our production line.

"We found that non-conductive plastic dust was collecting on the relay contacts, causing them to fail. When this happened, production was halted. Losses amounted to four percent.

"Two years ago we installed Clark Type PM relays, in which each set of contacts is shielded by its own melamine housing. Production stoppages from plastic dust have been cut to zero."



The unique sectional pole construction of the Clark Type "PM" relay offers many other important advantages

Compact, it's a space-saver. Rugged, it has built-in protection against vibration damage. Simple, it is easy to install and service. Each pole is a self-contained unit that can be removed, installed or replaced without disturbing the others. All terminals are in front for easy accessibility. Each pole has its own individual arcing chamber—a short circuit through one set of contacts is confined to a single pole, and will not destroy the entire relay.

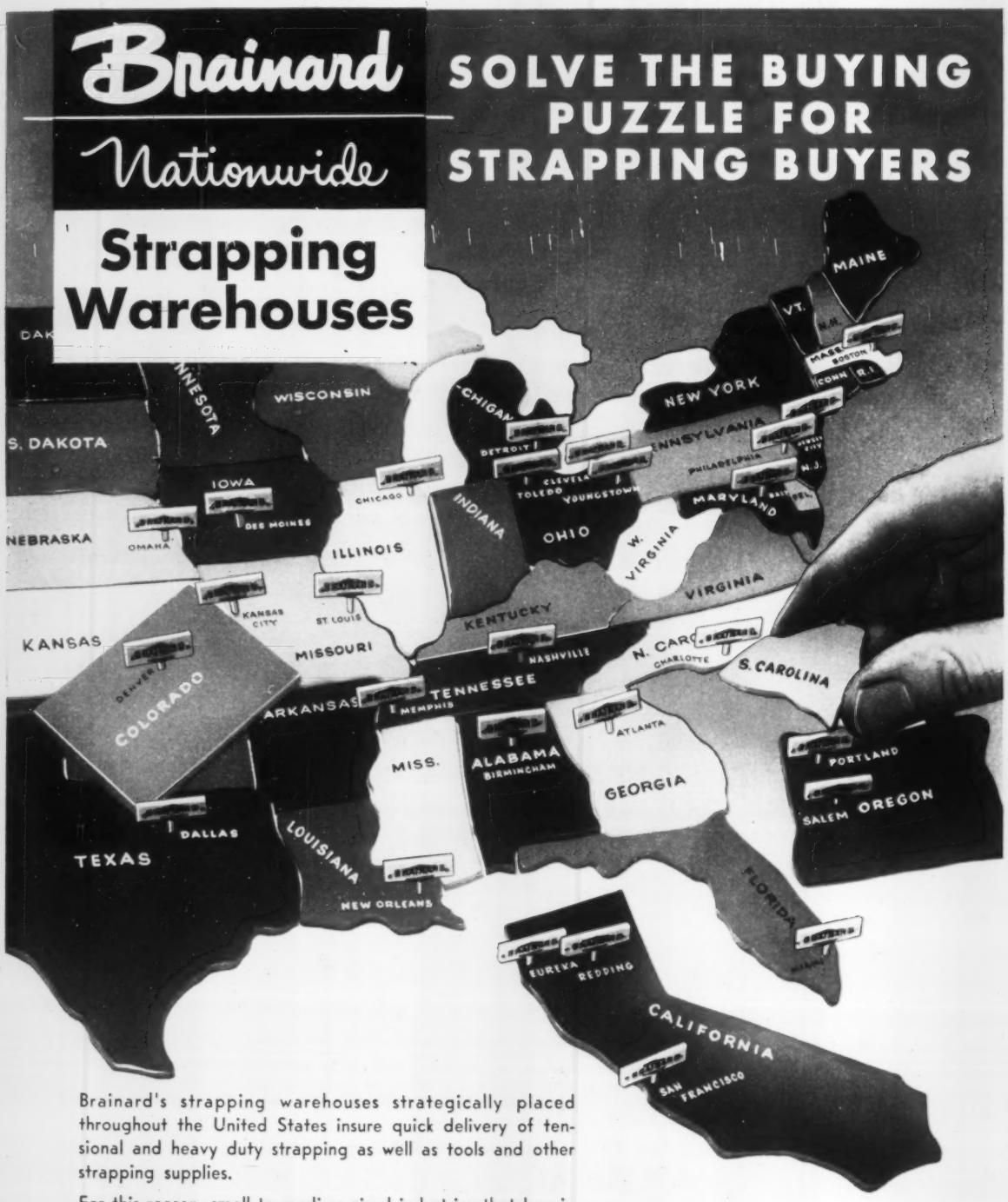
The **CLARK CONTROLLER** *Company*

Everything Under Control 1146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA: CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO

Brainard Nationwide Strapping Warehouses

SOLVE THE BUYING PUZZLE FOR STRAPPING BUYERS



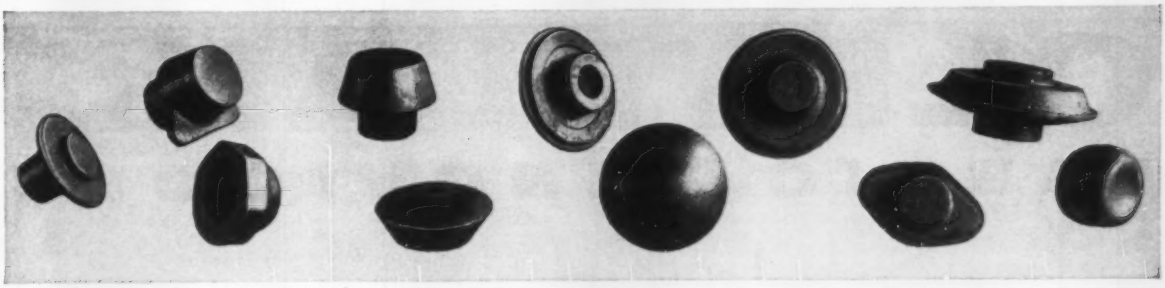
Brainard's strapping warehouses strategically placed throughout the United States insure quick delivery of tensional and heavy duty strapping as well as tools and other strapping supplies.

For this reason, small to medium sized industries that buy in relatively small quantities have found that Brainard's service and delivery are topped only by the quality of their product.

Brainard Steel Strapping

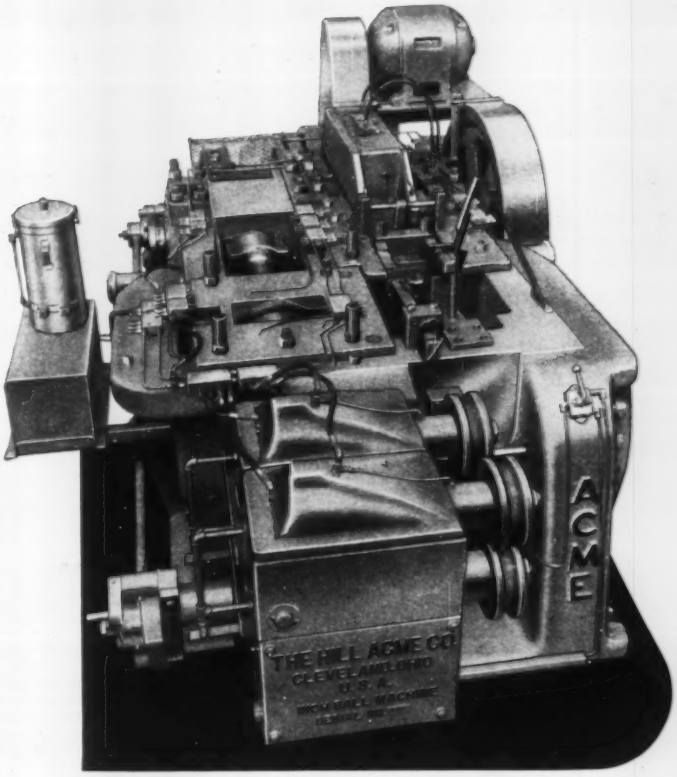
SHARONSTEEL

Brainard Steel Division, Sharon Steel Corporation
Griswold Street, Warren, Ohio



Typical Shapes Produced by ACME Single Blow Forging Machines

SINGLE BLOW FORGINGS
AT 135 PER MINUTE



● One man operating this ACME single blow solid die forging machine is producing 135 one inch hard steel balls per minute from 11/16″ stock. Automatic feed rolls carry bar stock at proper speed for maximum efficient operation. Adequate safety devices prevent jamming of the die.

ACME solid die forging machines are rated according to the size ball they will forge. Machines are built from 1″ to 5″ capacity.

Complete information is given in Bulletin SB-57.

The HILL ACME Company

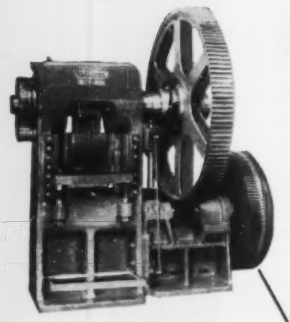
1207 W. 65th STREET • CLEVELAND 2, OHIO

HILL ACME TOOLS FOR INDUSTRY

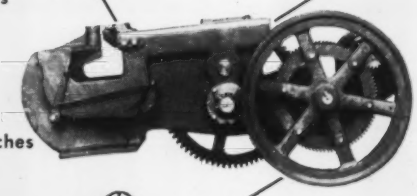
Manufacturers of: "ACME" FORGING • THREADING • TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BAR-BILLET SHEARS
"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • "CLEVELAND" KNIVES • SHEAR BLADES

CLEVELAND
FABRICATING TOOLS

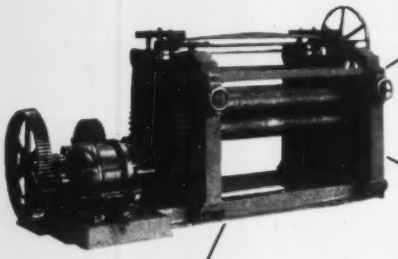
for Plate and Structural Steel



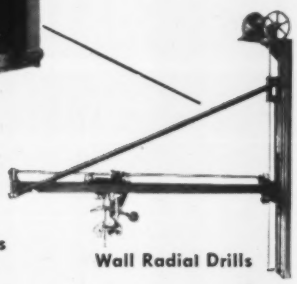
Bar Shears



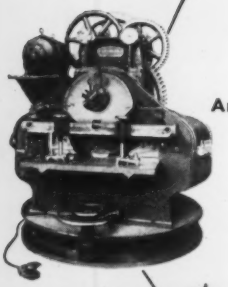
Horizontal Punches



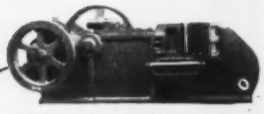
Straightening Rolls



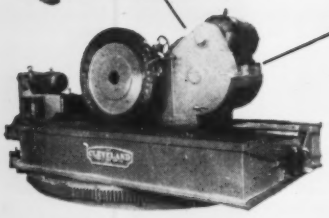
Wall Radial Drills



Angle Shears

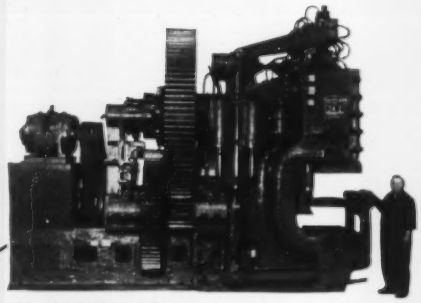


Bending and Straightening Machines



Rotary Planers

Bending Rolls



Vertical Open Gap Punching Machines

Ruggedly built for profitable production and simplicity of operation, Cleveland Fabricating Tools are designed for trouble-free operation and years of service.

This dependable, economical performance of Cleveland Fabricating Tools is a proven fact with leading shipyards, bridge builders, railroads, structural steel shops and boiler makers.

Since 1880, Cleveland has engineered its complete line of tools to be the finest, most efficient for punching, shearing, bending, coping and notching bars, angles, plates, I-beams and other structural shapes. Write for Folder FT48 to help you determine the correct fabricating tool for your needs.

AA-6114

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

Power Presses
Fabricating Tools
Punching Tools & Dies

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

Offices
NEW YORK
DETROIT
CHICAGO
PHILADELPHIA
EAST LANSING
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39 Sources

...ONE NEAR YOU FOR FAST SERVICE

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PITTSBURGH SCREW & BOLT CORP.
Pittsburgh 33, Pennsylvania

PROGRESSIVE MANUFACTURING CO., DIV. OF TORRINGTON CO.
Torrington, Connecticut

RELIANCE DIVISION, EATON MANUFACTURING CO.
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Bolt & Nut Division, Cleveland 13, Ohio

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NATIONAL LOCK COMPANY
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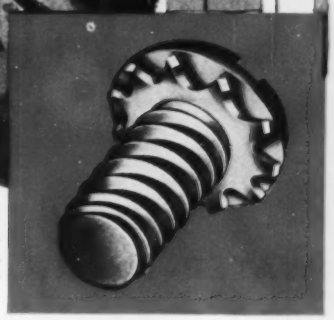
THE NATIONAL SCREW & MFG. CO.
Cleveland 4, Ohio
Los Angeles 22, California

PARKER-KALON DIVISION, GENERAL AMERICAN TRANSPORTATION CORP.
Clifton, New Jersey.



When ordering Sems, specify SHAKEPROOF® Lock Washers, specifically designed for a perfect match.

pre-assembly...

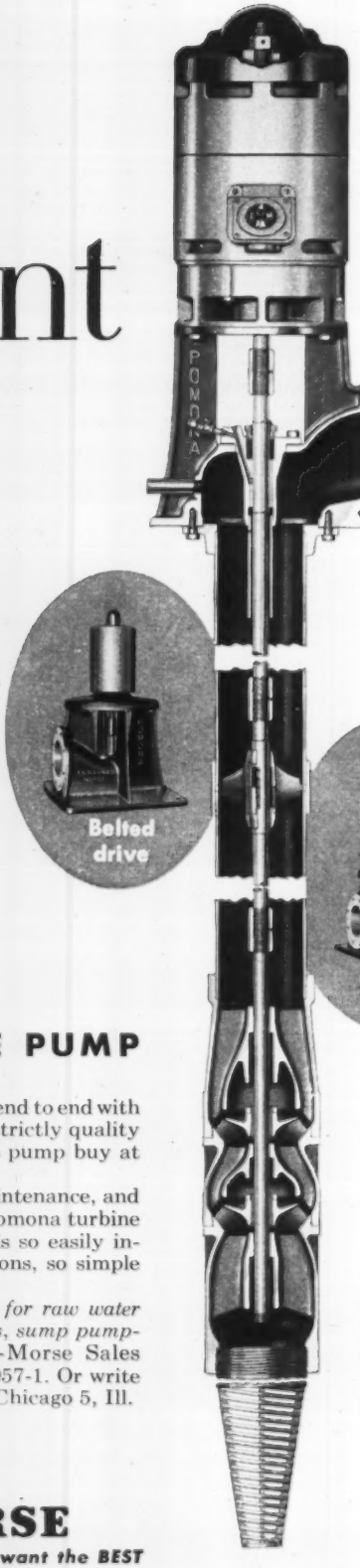
reduces handling...saves time and money

Sems fasteners are pre-assembled to cut wasteful hand operations in mass-assembly production. Washers can't be lost or forgotten and rejects due to mismatched screw and washer are stopped. Often hopper-fed for automatic driving, pre-assembled Sems are a first step in automation.

Sems

SEMS is a development of Illinois Tool Works, Chicago itw

You'll want to look into this pump



F-M UNI-DRIVE MOTOR

Belted drive

Geared drive

NEW F-M POMONA WATER-LUBRICATED TURBINE PUMP

Here is an all-new, extra rugged pump designed from end to end with the cost-conscious user in mind. A close look at its strictly quality features reveals why it's recognized as today's top pump buy at *any* price.

For ruggedness of construction, simplicity of maintenance, and strictly quality design throughout, this new F-M Pomona turbine pump is today's greatest value. No other pump is so easily installed, so easy to adjust for varying field conditions, so simple to change between electric, belted or geared drive.

Ask for details on this new F-M Pomona pump for raw water supply, air conditioning, refrigeration, cooling towers, sump pumping, dewatering, etc. Contact your Fairbanks-Morse Sales Engineer today. Ask for new illustrated Bulletin 6957-1. Or write Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

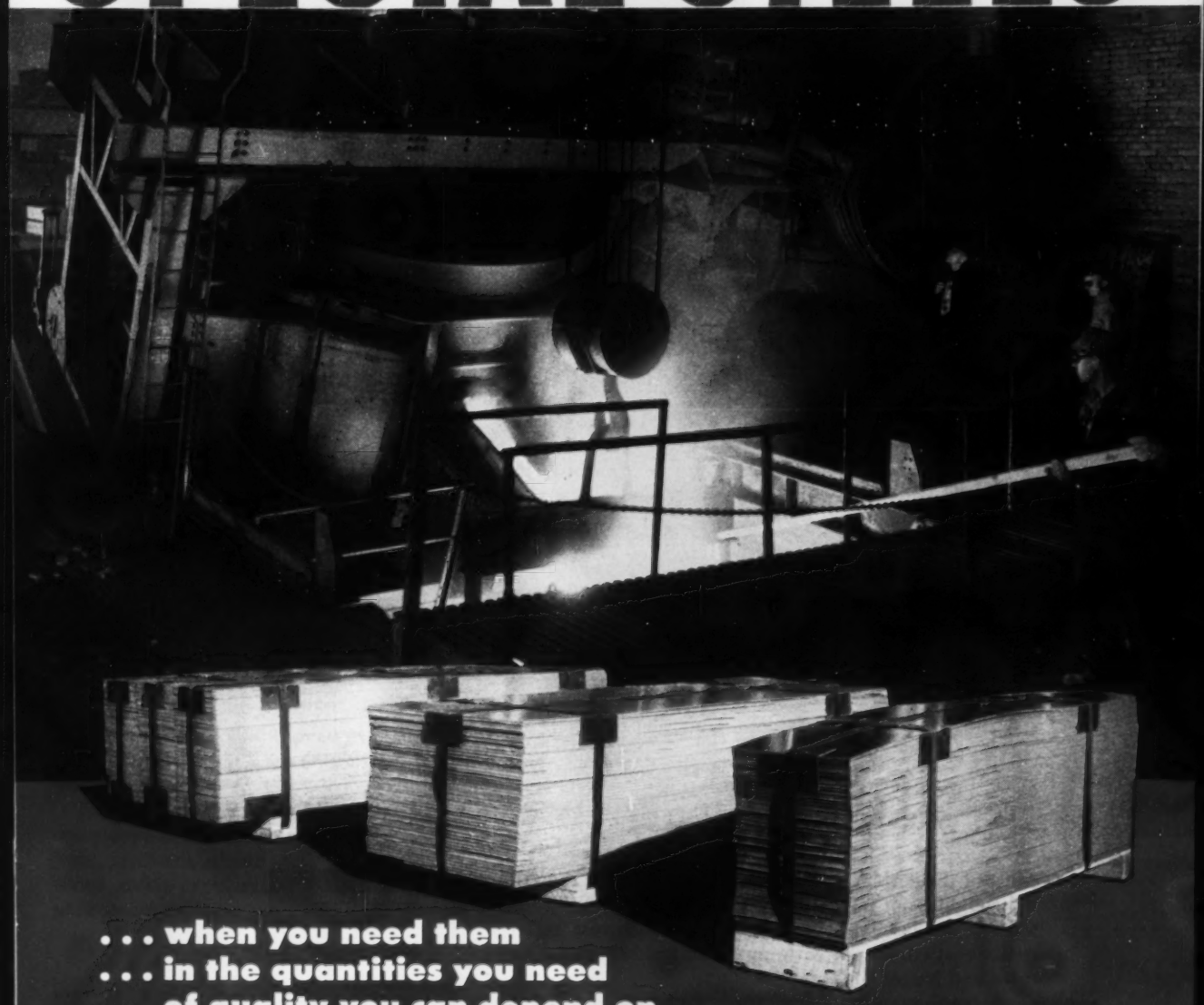
Seven Fairbanks-Morse pump factories in the United States, Canada and Mexico build the world's greatest variety of hydraulic combinations offered by any manufacturer of liquids-moving machinery.

FAIRBANKS-MORSE

a name worth remembering when you want the BEST

PUMPS • SCALES • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • RAIL CARS • HOME WATER SERVICE EQUIPMENT • MAGNETOS

SPECIAL STEELS*



. . . when you need them
. . . in the quantities you need
. . . of quality you can depend on

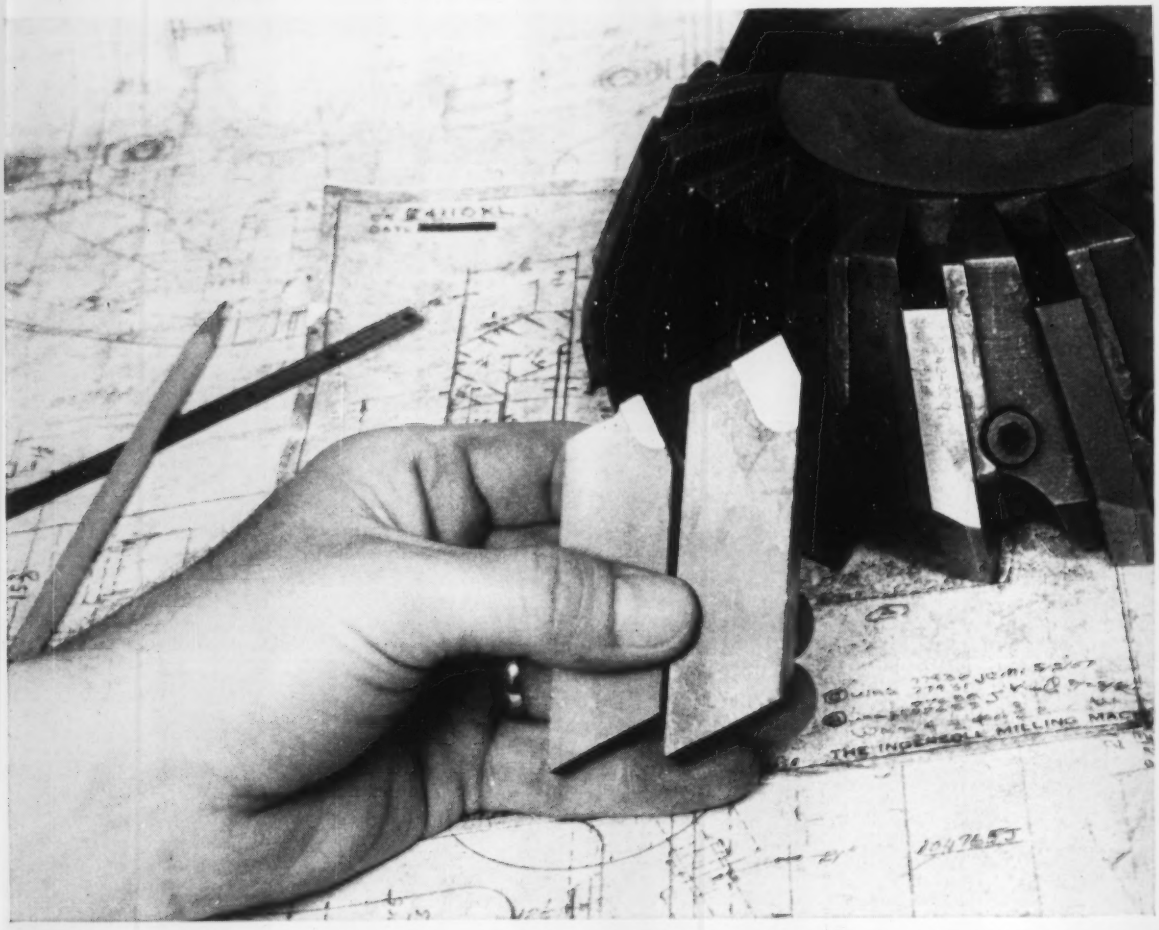
from centrally located **Ingersoll Steel**

When service counts, you can count on Ingersoll for a wide variety of special purpose steels.* Being a specialty mill, Ingersoll offers great flexibility in production scheduling, set up to fit your own requirements. Ingersoll's advantageous location at New Castle, Indiana assures prompt deliveries. And Ingersoll's modern quality-control facilities mean dependably uniform high quality from one order to the next. On all these counts, it will profit you to consult Ingersoll—a good name to know, a good place to go for the special steels you need.

* stainless steels • heat-resisting steels • ImAdod stainless-clad sheets • alloy steels • forging quality electric steel ingots • automotive clutch plate steels • Tom-Cross cross-rolled steel • carbon electric steel for tractor clutch discs • knife steels • saw steels • high speed hack saw steels • soft center and other agricultural steels • special analysis steels

INGERSOLL STEEL B-W BORG-WARNER

Ingersoll STEEL DIVISION
Borg-Warner Corporation
New Castle, Indiana



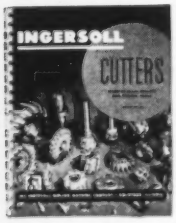
Ingersoll Cone-Type Face Mill for general purpose milling . . . designed for low replacement blade cost.

Do You Get Your Money's Worth?

Most of the carbide in the worn blade was used, but this in itself does not mean that it was used effectively. Many factors are involved in developing the lowest milling cutter cost consistent with improved finishes, faster feed rates and longer tool life.

A continuous review of these factors is part of the day-to-day responsibility of your Ingersoll cutter salesman and of the staff of milling experts he represents. This part of our product has proved its value to hundreds of concerns.

We will welcome an opportunity to tell you more about this service. Write:



If you do not have a copy of this book, write us and we will send you one. It describes in detail the complete line of Ingersoll inserted blade milling and boring tools. Ask for Catalog # 66V.

CUTTER DIVISION

THE INGERSOLL MILLING MACHINE COMPANY

505 FULTON AVENUE ROCKFORD, ILLINOIS

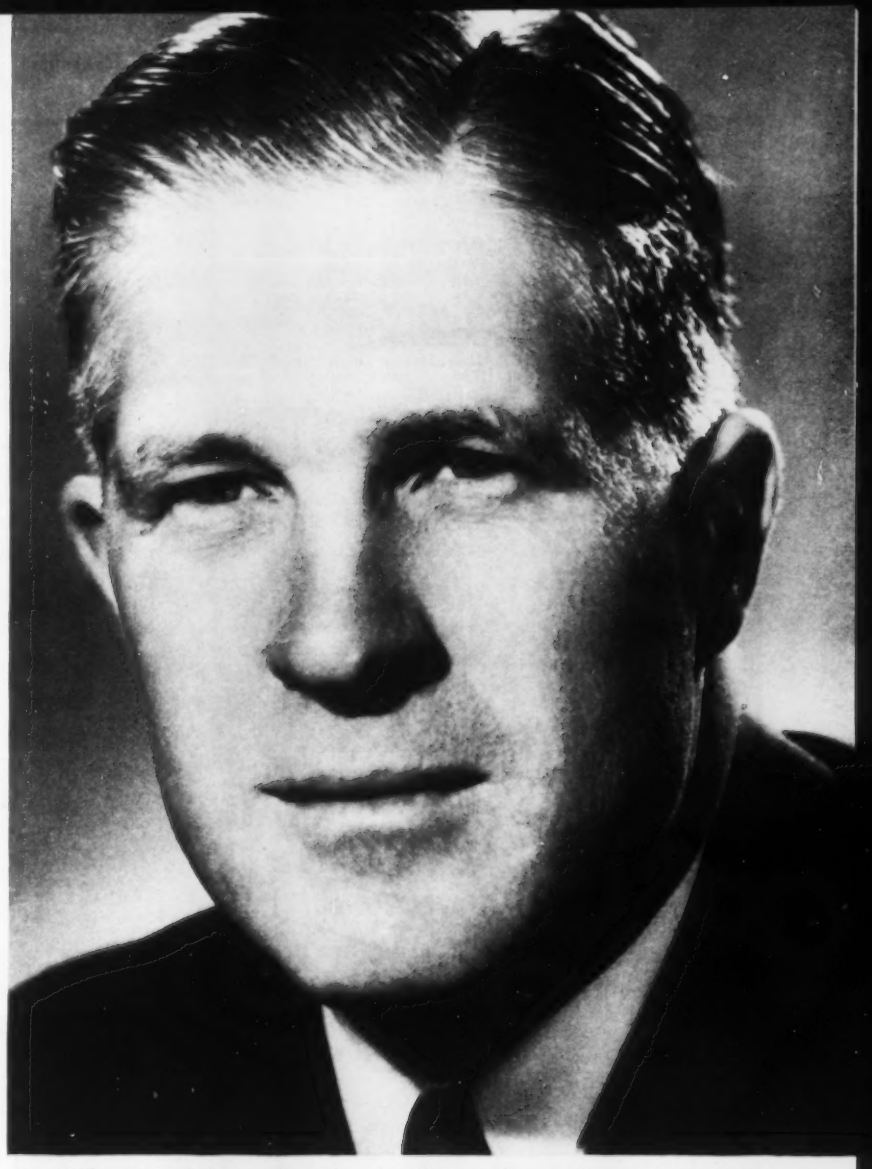
Your Sales Battles Won Easier with Phillips Screw Quality Control Plan

George Romney, industrial statesman, sums up the quality-control activity of the Screw Research Association this way:

"Control that assures a good quality product is one of the most important assets any industrial organization can have."

The Phillips Cross-Recessed Head Standards Committee has set up standards assuring reliability in delivering every advantage inherent in the Phillips Recess design. This means adherence to the best possible dimensional designs and the use of recommended inspection gauges and methods.

Phillips Screws made by the companies listed below improve your products, assure their fastener safety and reduce your production costs.

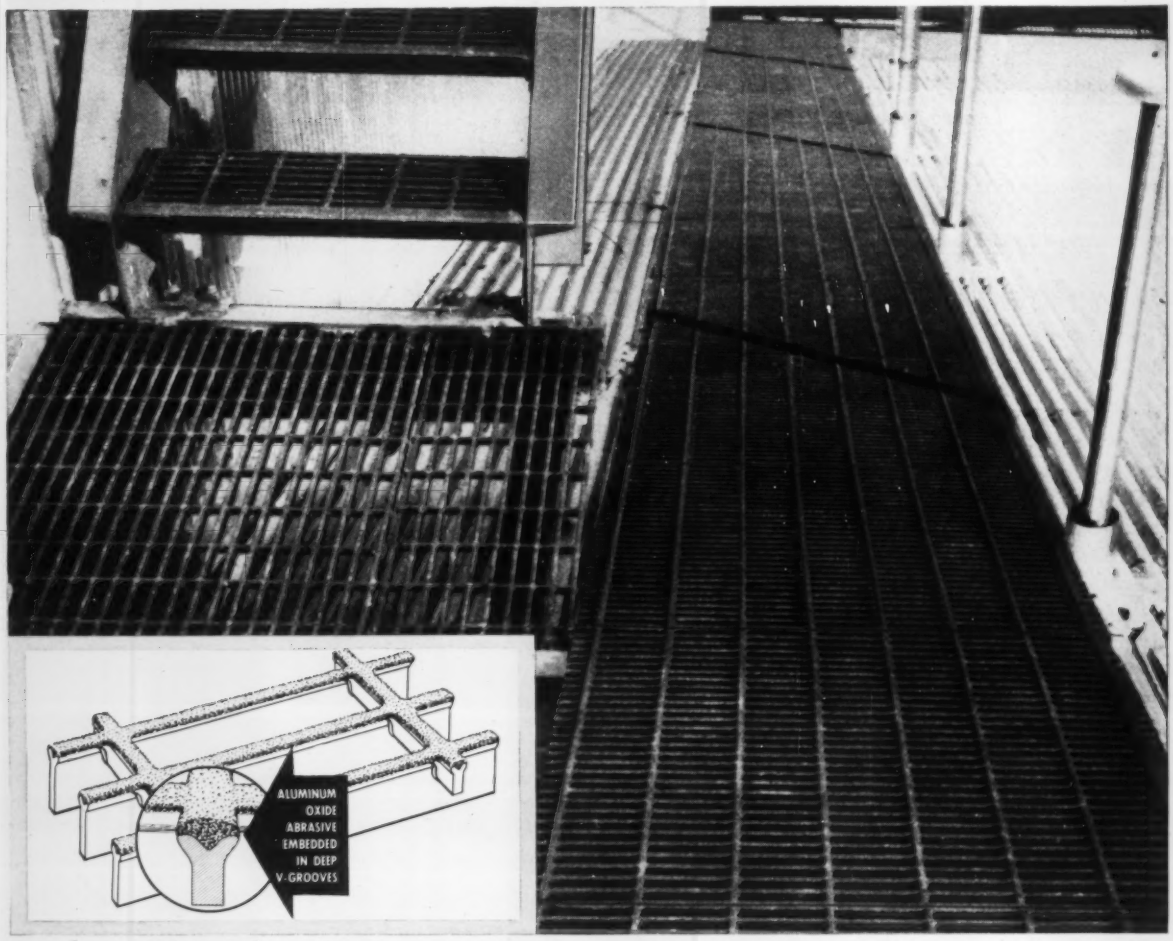


MR. GEORGE ROMNEY is president, American Motors Corporation and president, Automobile Manufacturers Association. He says, pertinent to the Screw Research Association's plan, "The more care you use in selecting top quality materials and parts, the easier it is for you to win your sales battle."

Members of Screw Research Association...

You can rely on these sources . . . for product reliability

American Screw Company • Atlantic Screw Works, Inc. • The Blake & Johnson Co. • Central Screw Company • Continental Screw Co. • Elco Tool and Screw Corporation • Great Lakes Screw Corp. • The H. M. Harper Company • The Lamson & Sessions Company • National Lock Company • The National Screw & Manufacturing Company • Parker-Kalon Division, General American Transportation Corporation • Pheoll Manufacturing Co. • The Progressive Manufacturing Company Division, The Torrington Company • Scovill Manufacturing Company • Shakeproof Division Illinois Tool Works • The Southington Hdwe. Mfg. Company Sterling Bolt Company • Universal Screw Company • Wales-Beech Corporation



RELGRIT® provides safe footing on sharply sloping roofs at AEC St. Louis Plant

Reliance Relgrit gratings and treads are providing safe access to stacks, filters and other equipment across the 18° sloping roof of the AEC Feed Material Plant near St. Louis. The abrasive surface of Relgrit was picked as a truly non-skid surface for ramps, stairways and walks leading to equipment which had to be serviced frequently.

The top surfaces of the bearing bars have ⅛" deep V-grooves in which is embedded aluminum oxide abrasive grains in a hard resin. The material is not affected by water, oil, gasoline, greases, or the most commonly used acids, alkalis and other chemicals, which gives it a long service life under the most severe conditions. If you have operations in which the floors become oily, greasy, wet, or slick from any other cause, Relgrit can provide safe footing at very low cost. Write for complete information and samples.

*you can't slip on Relgrit**

*Patent applied for

Reliance Steel Products Company

P. O. Box 510-F, McKeesport (Pittsburgh District), Pa.

Relgrit Abrasive Gratings and Treads • Lightweight Bridge Flooring
Steel, Stainless and Aluminum Grating • Steel Mill Equipment

ROLLS and ROLLING MILL EQUIPMENT

The RED Circle is your guarantee!

The Hyde Park Red Circle is a sign of quality—and an assurance of high performance. It is indelibly stamped on the end of every Hyde Park Roll. There is a type and size of roll that will not only best serve your needs, but roll up new endurance records.

Dependability and super-performance are built into Stretcher Levellers and all other Hyde Park Rolling Mill Equipment. So, when smoother operation, low maintenance cost and economical production are factors in your thinking, consider the many advantages of Hyde Park equipment.

A "Red Circle" Roll for Every Purpose

Alloy Iron Rolls . . . Grain Rolls
Chilled Rolls . . . Nickel Chilled Rolls
Moly Rolls . . . Cold Rolls . . . Sand Rolls

Rolling Mill Equipment

Bar Mills • Merchant Mills • Sheet and Strip Mills • Pinion Stands
Roller Tables • Reduction Drives
Stretcher Levellers • Guillotine Shears
Sheet Mill Shears • Roll Lathes
Special Machinery • Machine Work

Gray Iron Castings up to 80,000 lbs.

Hyde Park FOUNDRY & MACHINE CO.
HYDE PARK, WESTMORELAND COUNTY, PITTSBURGH DISTRICT, PA.

Roebling Royal Blue Wire Rope will **wear** and **wear** and **wear**!

This working quality means longer service life on *your* job. Add to this the fact that Royal Blue is stronger than the strongest rope you have been using and you have two excellent reasons why it has enjoyed faster acceptance than any wire rope in Roebling's history. Your distributor or Roebling Sales Office will give you the complete story, or contact John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

Distributors, Branches and Warehouses Throughout the Country—Subsidiary of The Colorado Fuel and Iron Corporation

What has changed?

True, the truck designs as well as methods have changed,

but the fundamental principals upon which CHICAGO CONCRETE BREAKING COMPANY

(recently changed to THE EDWARD GRAY CORPORATION)

was founded are as much in practice today as they were 36 years ago.

"WANTED! A HARD JOB" is as much our (proud) bid for your business today as it was then. No job is too small, no job too large or involved.

If you are planning new construction or expansion of present facilities take advantage of the experience and skill that is to be found in the complete design, engineering, demolition and construction facilities of THE EDWARD GRAY CORPORATION.

General Offices:
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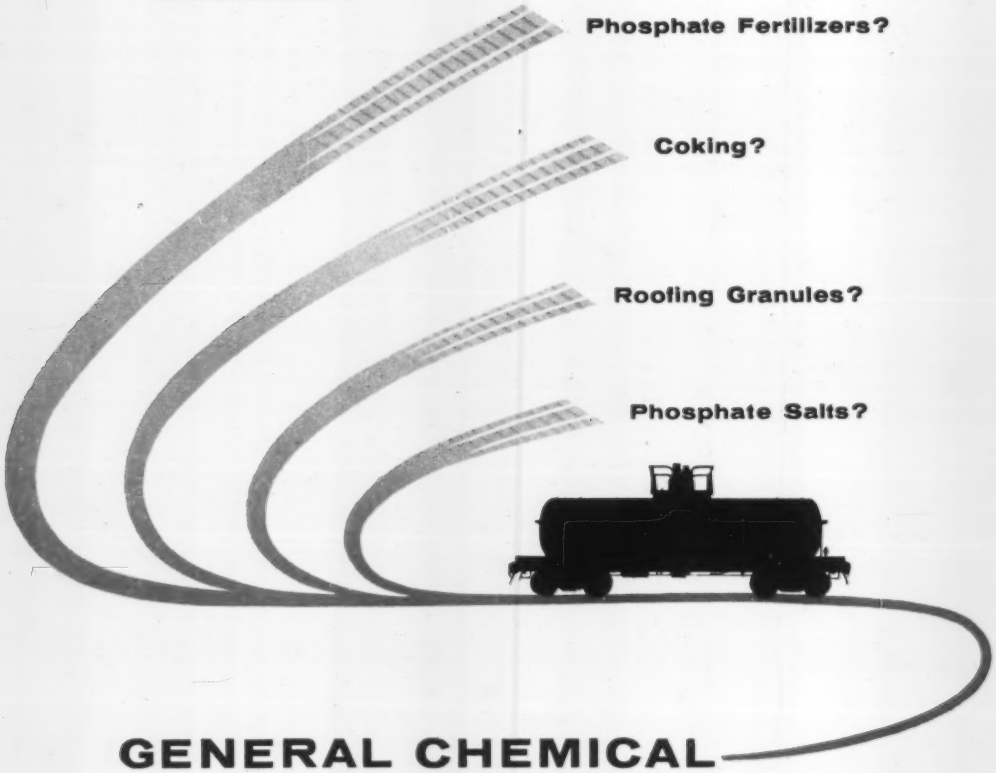
TELEPHONE BAYPORT 1-8400

THE EDWARD GRAY CORPORATION
FORMERLY CHICAGO CONCRETE BREAKING CO.

Eastern Offices:
213 COREY AVENUE, BRADDOCK, PA.
TELEPHONE ELECTRIC 1-1656

WHAT'S YOUR LINE?



GENERAL CHEMICAL

offers a superior quality of wet process

PHOSPHORIC ACID, 65%

Commercial and Fertilizer

(47% min. P_2O_5)

Now, America's foremost producer of mineral acids offers industry a superior commercial grade of wet process Phosphoric Acid.

Not a by-product! General Chemical Phosphoric Acid is made especially for such uses as the manufacture of phosphate salts, fertilizers (liquid, granulation, enrichment, etc.) and other applications. It is specially treated to remove the excessive amounts of sulfuric acid, fluorine and silicates found in ordinary fertilizer-grade phosphoric.

It will pay you to see General Chemical now for your requirements if you are using phosphoric acid or anticipate a future need. For samples, prices and other data, phone or write your nearest General Chemical sales office.

Other "GC" Mineral Acids include

Sulfuric Acid
Mixed Acid
Nitric Acid
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aqueous and anhydrous
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Basic Chemicals for American Industry

GENERAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

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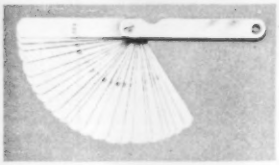
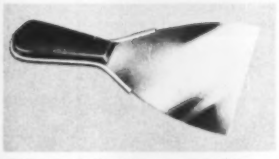
Match your specifications from a wide range of Wallace Barnes Specialty Steels





For all-around toughness, with light weight and easy workability, you can't beat these fine springmaker's steels. Rolled in our specialty mill where quality and precision are paramount, you'll find them ideal for finished products or components. A wide range of sizes and finishes in stock or to special order. Write for our Steel Fact Book, an unusual story about unusual steels.

WALLACE BARNES STEEL DIVISION

ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT

Somers THIN STRIP

25,000:1

ONE OF THE LARGEST SENDZIMIR MILLS ever built for the non-ferrous industry now enables Somers to supply thin strip down to .001" as wide as 25" — a fantastic ratio of 25,000:1.

With the installation of this facility Somers, as a leader in thin strip production, is prepared to meet the broadest range of dimensional specifications, since it is already supplying thin strip down to .0001" in narrower widths.

SENDZIMIR COLD STRIP MILLS

for rolling both ferrous and non-ferrous metals to exacting standards are engineered and built by

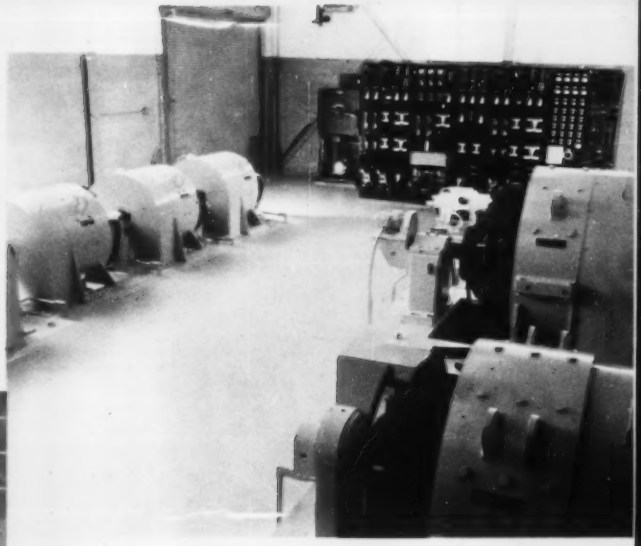
THE WATERBURY FARREL FOUNDRY & MACHINE CO.

Waterbury, Conn.—U. S. A.

FOR EXACTING STANDARDS ONLY

Somers specializes in rolling the one thin strip job in ten that must be held to the most rigid specifications.

Pure Nickel, Monel, Inconel, Inconel "X", and Stainless Steel are produced in gauges from .0001" to .020". Electrolytic Copper and its alloys, such as Brass, Nickel Silver and Phosphor Bronze from .0001" to .010".



An all important factor in maintaining close tolerances, not only in thickness but in temper and tensile strength, is the careful control of the next to final as well as finish rolling.

ELLIOTT COMPANY, Jeannette, Penn. supplied all electrical drive and control for the mill. An Elliott 500-hp, 500/900-rpm, d-c motor powers the work rolls. Each winding reel is driven by a 350-hp, 400/800-rpm motor. Adjustable voltage power for these motors is supplied by a 5-unit Elliott motor-generator driven by a 1000-hp, 2300-volt synchronous motor. The photo above shows a portion of the motor room, with two of the mill drive motors in the foreground.

Whatever your requirements, you can depend on Somers for thin strip that meets the most exacting standards.

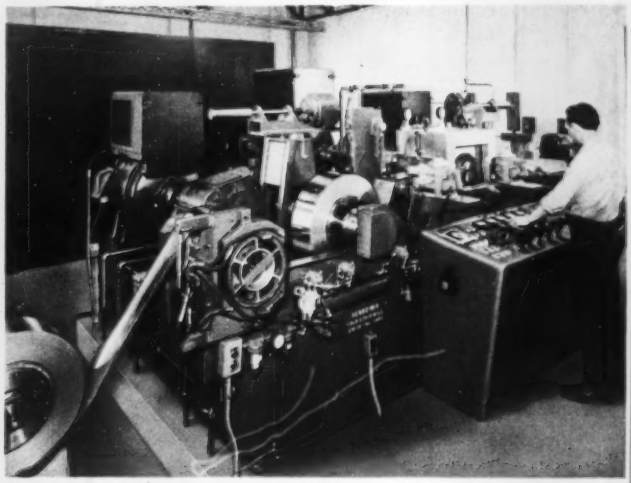
Somers THIN STRIP

SOMERS BRASS COMPANY, INC.
Waterbury, Conn.

ULBRICH Stainless Steels

EXACTLY as you want it

With expanded facilities and ultra modern machinery including new Sendzimir mill, annealing furnace, slitters, flatteners, edgers and other rolling mill equipment, Ulbrich stainless strip can be supplied to your exact requirement in gauges from .0005 to .125, widths from .040" to 12", any temper, in any quantity from a foot or pound up.

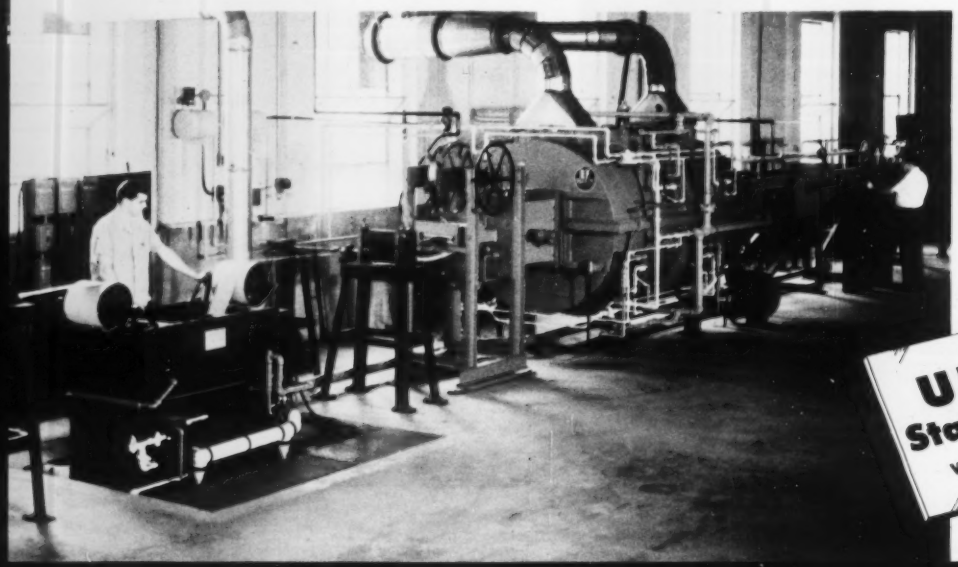


Constant inventory of over 1,000,000 pounds . . .

Ulbrich maintains a complete stock of types 301, 302, 304, 305, 316, 321, 347, 410, 420 and 430. Tolerances can be held to .0002 on gauge, .0015 on width. Immediate delivery on stock orders.

Sendzimir Mill rolls to 1/6 the thickness of a human hair

The Biggest Little Mill in the country can supply precision rolled Stainless Steel Strip down to .0005 in widths up to 8". This new mill is typical of Ulbrich's close control of all operations performed in our own plant by our own personnel.

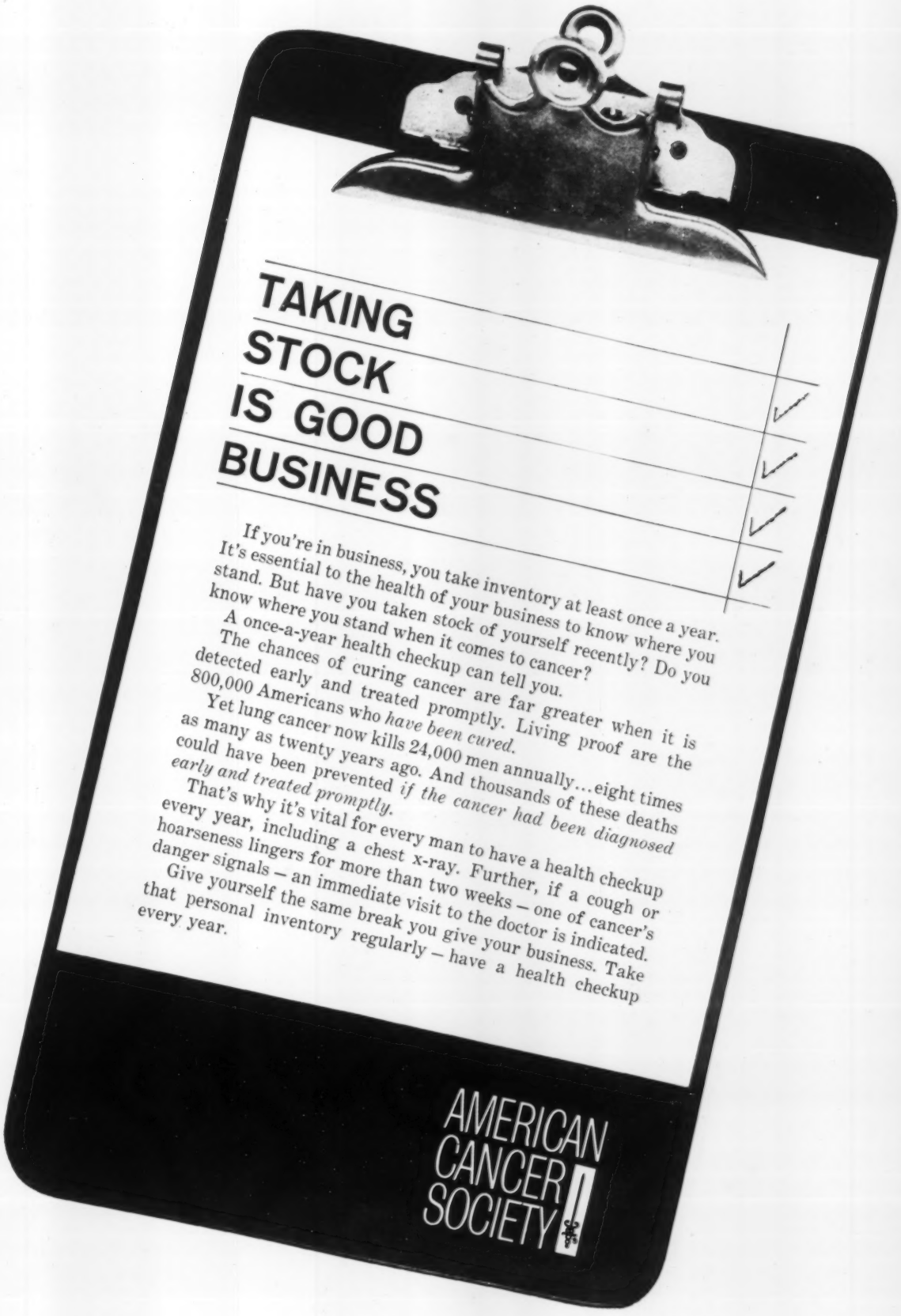


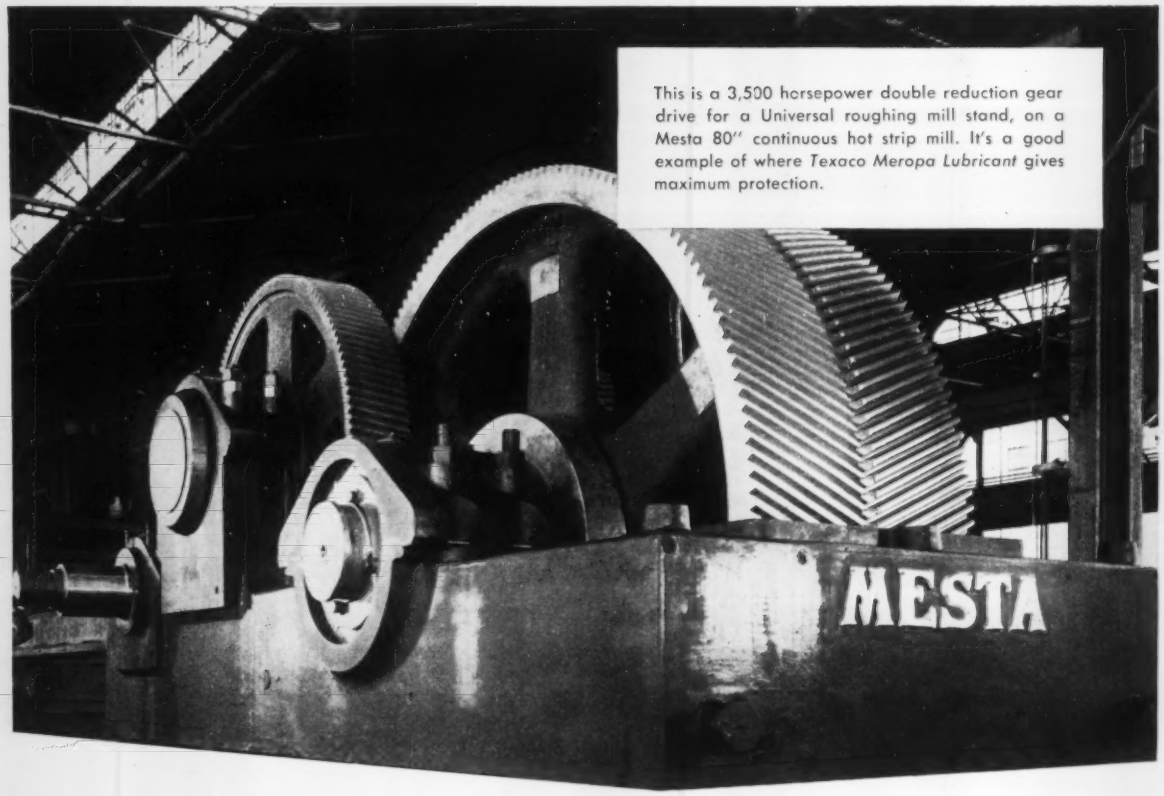
New controlled atmosphere continuous Electric Furnace

This new furnace will bright anneal any Ulbrich material to any temper including dead soft. This is another example of how Ulbrich can support its claim to supply stainless strip *exactly as you want it.*

ULBRICH
Stainless Steels
Established 1924
WALLINGFORD · CONN.
Wallingford COlony 9-7771

Certified


TAKING
STOCK
IS GOOD
BUSINESS
If you're in business, you take inventory at least once a year. It's essential to the health of your business to know where you stand. But have you taken stock of yourself recently? Do you know where you stand when it comes to cancer?
A once-a-year health checkup can tell you.
The chances of curing cancer are far greater when it is detected early and treated promptly. Living proof are the 800,000 Americans who *have been cured.*
Yet lung cancer now kills 24,000 men annually...eight times as many as twenty years ago. And thousands of these deaths could have been prevented *if the cancer had been diagnosed early and treated promptly.*
That's why it's vital for every man to have a health checkup every year, including a chest x-ray. Further, if a cough or hoarseness lingers for more than two weeks – one of cancer's danger signals – an immediate visit to the doctor is indicated.
Give yourself the same break you give your business. Take that personal inventory regularly – have a health checkup every year.
AMERICAN CANCER SOCIETY



This is a 3,500 horsepower double reduction gear drive for a Universal roughing mill stand, on a Mesta 80" continuous hot strip mill. It's a good example of where *Texaco Meropa Lubricant* gives maximum protection.

POLAR ADDITIVES GIVE EXTRA PROTECTION TO COSTLY GEARS

Polar additives in *Texaco Meropa Lubricant* keep it adhering to gears under *all* operating conditions, including heat, pressure, severe moisture. *Texaco Meropa* has extreme pressure properties that give it a tougher lubricating film. It keeps gears working safely under extra-heavy or shock loads.

What's more, *Texaco Meropa Lubricant* resists oxidation and thickening, won't foam or separate—and it's non-corrosive. Result: Longer life for gears and bearings—less maintenance cost.

The *right* lubricant can save you money. The Texaco Lubrication Engineer in your area will help you do it. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO REG. T.M.

TEXACO Meropa Lubricants

FOR STEEL MILL GEAR DRIVES

Metalworking Outlook

Mess in Missiles?

"We are so far behind the Russians in missile technology that it will take a major breakthrough to catch them." That's the consensus of industry leaders attending a meeting of the Association of Missile & Rocket Industries, a new trade group. Major topics of conversation: Interservice rivalry in missiles, Defense Department spending cutbacks and small business' potential in missiles. Small company representatives were outspoken about the Pentagon's failure "to give us the chance to show what we can do." Three of the more recent contracts for missilework have been to large firms—Western Electric Co. ($104.2 million for Titan and Thor guidance systems), Aerojet Corp. ($55.7 million for the Titan propulsion unit), and Remington-Rand Div. of Sperry Rand Corp. ($24 million for Univacs for the Titan).

The Aircraft Cutbacks

Boeing Airplane Co. says Air Force curtailment of monthly payment to defense contractors may force it to slow production drastically. Chance Vought Aircraft Inc. says its work force probably will be reduced by about 1000 by yearend, to stay in line with federal economies. An eastern aircraft firm stopped work on a $32-million contract in July because of slow payments. The contract will be resumed in January when money is paid again. Asks the company: How much money will be lost in stopping, then starting that contract?

Calling All Inventors

Do you have an idea for a tunneling machine which can bore through earth at 6000 ft per hour? That's just a sample of 387 technical problems, vitally affecting national defense, which need solution. If you're interested in the list, get in touch with Commerce Department's National Inventors Council.

New Magnetic Steel

Westinghouse Electric Corp. announces a magnetic steel with the ability to magnetize in four directions. Called Cubex steel, the product will be used in the magnetic cores of transformers, motors, and other electrical equipment. Steel now used in cores can be magnetized in only two directions. Although the new material is still in the laboratory stage, it will probably be used in a few special commercial applications within the next few months.

Prefab Housing Grows

Look for prefabrication to account for half of all housing starts within the next five or ten years, Investment Banker Frederick K. Trask Jr. told

delegates to the Prefabricated Home Manufacturers' Institute. He predicts housing starts of at least 2 million a year by 1965. Despite a 20 per cent drop in housing starts this year, production of prefabs is holding its own. Productior this year will be between 90,000 and 100,000 house packages.

Big Business in Curtain Walls

Production of curtain walls for architectural purposes is at an annual rate of $100 million—600 per cent above the 1950 figure—and will soar to $325 million by 1965, predicts Kawneer Co., Niles, Mich., one of the manufacturers. The firm foresees these technical developments: A curtain wall package providing finished interior and exterior wall surfaces upon installation; panels with the radiant heating function built in; integrated utility panels to include plumbing and electrical conduits.

Personal Consumption To Rise, if—

A 50 per cent increase in personal consumption of goods and services by 1965 is forecast by President Philip M. Talbott of the U. S. Chamber of Commerce. He sees the gain on the assumption of a $600-billion gross national product by that date. More emphasis on marketing is needed, he says.

Kefauver Resumes Hearings

A. B. Homer, president of Bethlehem Steel Corp. and third highest paid man in U. S. industry, is earning only as much as he did in the 1940s and less than he did in the 1930s, figuring the falling value of the dollar and rising income taxes. Mr. Homer answered questions about his income when he appeared last week before Sen. Estes Kefauver's (D., Tenn.) Senate Antitrust & Monopoly Subcommitee. Of the 18 highest paid industrialists, 11 are from Bethlehem, three from General Motors Corp., two from Ford Motor Co., and one each from E. I. du Pont de Nemours & Co. and United Merchants & Manufacturers Inc.

UAW Strike Fund Mounts

When 1958 auto talks begin next spring, the United Auto Workers strike fund could nearly double the $25 million amassed for 1955 parleys. Without a special assessment, the fund already stands at about $25 million. A $5 monthly assessment, as in 1955, could quickly push the total to $40 million or $50 million.

Automotive Straws in the Wind

Reynolds Metals Co. says 1958 autos, trucks, and buses will use 400 million lb of aluminum, 15 to 20 per cent more than the 1957 vehicles did . . . American Motors (Canada) Ltd. expects to resume assembling cars in Canada . . . Goodyear Tire & Rubber Co. is in volume production of rubber air springs for autos.

NOW THAT OLD BILL HAS HIS HEAT TAPPING HE'S TRYING TO REMEMBER WHAT ALL WENT INTO IT.
YEAH, HE CAN'T EVEN REMEMBER WHAT HE HAD FOR LUNCH.
I WONDER IF HE'LL SHOW THAT HE USED FOUR BOXES OF FEED ORE AND A 30,000 POUND DRINK.
THANKS TO AN ANONYMOUS CONTRIBUTOR
KUEKES

A Photographic Memory

WHY NOT DESCRIBE YOUR OPEN-HEARTH CARTOON IDEA AND SEND IT ALONG TO US?

The benefits steelmakers obtain from our refractories are in part a result of Basic's on-the-job servicing. One of the rewards of this close relationship has been the opportunity to observe and appreciate the lighter side of these usually serious craftsmen.

BASIC INCORPORATED 845 HANNA BUILDING • CLEVELAND 15, OHIO

Typical Tensile Properties of Armco PH 15-7 Mo Sheets in Condition RH 950

	75 F	600 F	800 F	1000 F
Ultimate Strength, psi	240,000	205,000	182,000	130,000
0.2% Yield Strength, psi	215,000	178,000	152,000	105,000
Elongation, % in 2″	6	5	8	14
Hardness, Rockwell	C48	—	—	—

NEW Armco PH 15-7 Mo Stainless Steel offers typical ultimate tensile strength of 240,000 psi

Exceptional tensile properties — excellent strength up to 1000 F — commercially available in all forms.

Armco PH 15-7 Mo Stainless Steel was especially developed as an aircraft metal—to withstand friction-generated heat and the racking stresses of high-speed flight. But its unique properties make it worthy of consideration for other products or parts that require exceptional strength and corrosion resistance.

Unmatched Combination of Properties

- **High mechanical properties. Typical ultimate tensile strength of 240,000 psi at 75 F in sheet, strip, thin-gage strip; guaranteed minimum tensile strength of 225,000 psi.**
- **Unusually high strength-weight ratios.**
- **Better creep strength from 600 to 1000 F than any other metal sheet or foil.**
- **Excellent short-time tensile properties to 1000 F.**
- **Easy to fabricate.**
- **Simple heat treatment that minimizes distortion — speeds production.**
- **Good corrosion resistance.**

Available Now in All Forms

New Armco PH 15-7 Mo is commercially available in thin-gage strip (foil), strip, sheet, plate, bar, wire, and billets. It is the most recent addition to Armco's family of high-strength precipitation-hardening stainless steels. Others are Armco 17-4 PH and 17-7 PH.

• • •

For more data about new Armco PH 15-7 Mo—properties at room and elevated temperatures, available sizes, and gages, heat treatment, and fabrication techniques—just fill in and mail the coupon. We will send you the new Armco folder on this special stainless grade.

ARMCO STEEL CORPORATION
2237 Curtis Street, Middletown, Ohio
Send me your folder on new Armco PH 15-7 Mo Stainless Steel.
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Know Your Materials

A thorough study of the evolution of metals is made each year by STEEL's editors at the time of the National Metal Congress & Exposition.

The results of this year's study are interpreted in a concise article (Page 162) and reported in a Metal Selector (following Page 168), which details the compositions, properties, forms, and applications of several hundred metals.

Changes in materials often take place with little fanfare. So we feel obligated to point out their significance.

Included among the American Iron & Steel Institute's standard specifications are 188 types of alloy and H-steels. A few new steels have been added, but some 50 have been dropped in two years because of declining usage—either because of nonavailability (key alloying elements couldn't be obtained) or because users had switched to other grades.

The number of stainless steel specifications is growing because of new requirements in the aircraft, atomic reactor, missile, automotive, architectural, and other fields.

Casting users are becoming more specification conscious. They find a wide range of types available in gray iron, malleable, steel, and nonferrous metals. Their properties and applications cover a wide range. Steel castings, for instance, are approaching the 300,000 psi range. Magnesium alloyed with thorium will take temperatures up to 800° F.

A new aluminum alloy with a bright finish is adaptable for auto bumpers, store window trim, and appliances. The standard copper alloys have been supplemented with many special and proprietary alloys.

Those and other new and improved metals offer one of the few remaining avenues open for cost saving.

Saving is not a matter of switching from a good material to a cheaper one. It requires choosing the metal that is fabricated economically and is most suitable for the job.

Irwin H. Such
EDITOR-IN-CHIEF

New facts on inventory costs revealed by IRON AGE survey

ning program: A steel pin is ... Inventory carrying ... age inventory x fixed cost of 15

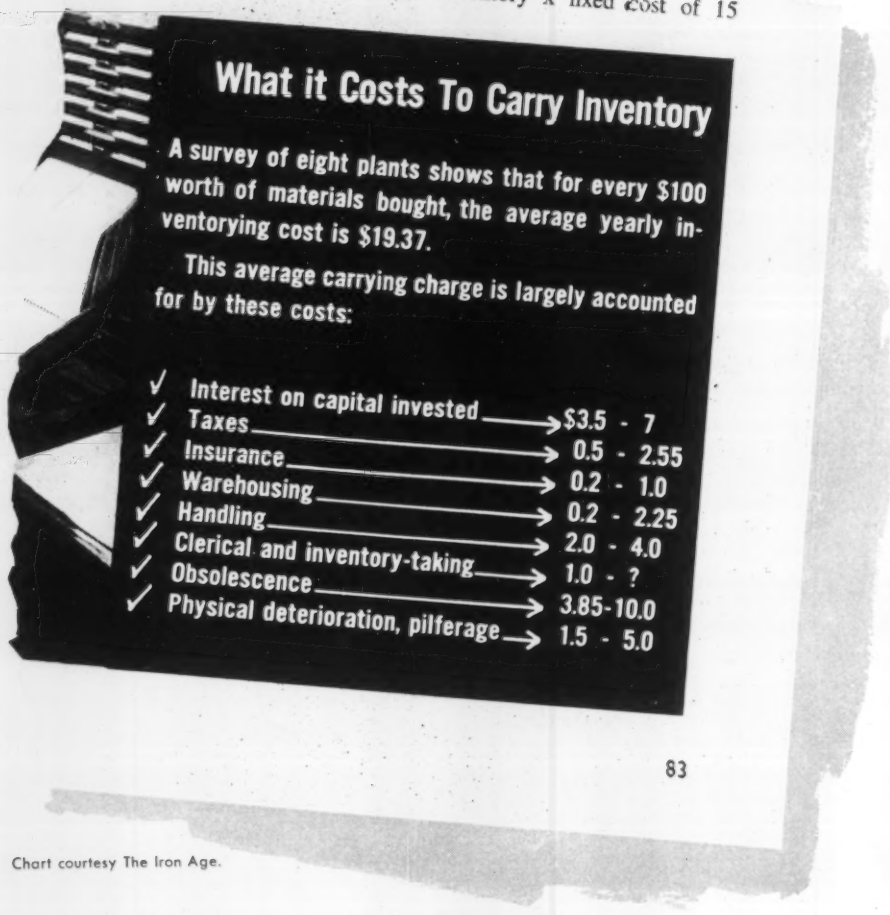

What it Costs To Carry Inventory
A survey of eight plants shows that for every $100 worth of materials bought, the average yearly inventorying cost is $19.37.
This average carrying charge is largely accounted for by these costs:
Interest on capital invested → $3.5 - 7
Taxes → 0.5 - 2.55
Insurance → 0.2 - 1.0
Warehousing → 0.2 - 2.25
Handling → 2.0 - 4.0
Clerical and inventory-taking → 1.0 - ?
Obsolescence → 3.85-10.0
Physical deterioration, pilferage → 1.5 - 5.0
83

Chart courtesy The Iron Age.

Here's help on steel inventory costs . . .
In these days when working capital is tight and interest rates are high, it's especially important not to let inventory take dollars you can use elsewhere. You can save money on steel inventory costs by letting Ryerson carry the inventory for you. It's already here, at Ryerson—in the nation's largest stocks of steel. And Ryerson has the organization to deliver what you want when you want it. For immediate steel service, call the Ryerson plant near you.

RYERSON STEEL

Principal products: Carbon, alloy and stainless steel — bars, structurals, plates, sheets, tubing • aluminum, industrial plastics, machinery, tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK · BOSTON · WALLINGFORD, CONN · PHILADELPHIA · CHARLOTTE · CINCINNATI · CLEVELAND DETROIT · PITTSBURGH · BUFFALO · INDIANAPOLIS · CHICAGO · MILWAUKEE · ST. LOUIS · LOS ANGELES · SAN FRANCISCO · SPOKANE · SEATTLE

PLUS Factors...Overbalance MINUS Factors...

1. PLENTIFUL GOODS.
2. HIGH RATE OF SHIPMENTS.
3. GOOD QUARTER FOR AUTOS.
4. RISING ELECTRIC EQUIPMENT.
5. EARNINGS FROM ACQUISITIONS.
6. STEADY CONSTRUCTION.
7. IMPROVED PRODUCTION METHODS.
8. EMPHASIS ON COST CONTROL.
9. HIGHER PRICES.
10. NO MAJOR STRIKES.

1. RISING LABOR COSTS.
2. HIGHER MATERIAL COSTS.
3. BOOSTED SHIPPING CHARGES.
4. START-UP EXPENSES.
5. EXPANSION COSTS.
6. DROP IN DEFENSE SPENDING.
7. HIGHER R & D COSTS.
8. SOME WEAKENING IN DEMAND.

So Metalworking's Third Quarter Profits Rise...

SELECTED MANUFACTURERS	1957	1956
Alco Products Inc.	$1,084,000	$882,000
Bell & Howell Co.	760,939	551,379
Beryllium Corp.	167,156	163,026
Buffalo Forge Co.	526,229	416,915
Carborundum Co.	948,673	990,663
Caterpillar Tractor Co.	9,888,997	13,527,966
Cleveland-Cliffs Iron Co.	4,963,050	3,700,209
Continental Can Co. Inc.	14,537,000	13,771,000
Cooper-Bessemer Corp.	1,562,000	1,362,000
Diamond Alkali Co.	1,485,379	2,348,410
Diamond T Motor Car Co.	295,460	322,631
Douglas Aircraft Co. Inc.	8,036,183	7,774,972
Driver-Harris Co.	62,222	141,539
Eastman Kodak Co.	25,434,611	22,214,888
Eaton Mfg. Co.	1,893,727	1,566,276
Federal-Mogul-Bower Bearings Inc.	2,064,000	1,846,000
Ferro Corp.	263,876	400,478
Garrett Corp.	518,700	1,241,400
General Electric Co.	55,165,000	47,863,000
General Instrument Corp.	169,599	119,916
General Steel Castings Corp.	924,688	719,307
Gillette Co.	7,355,253	6,682,722
Hanna (M. A.) Co.	6,181,451	4,952,410
Hussman Refrigerator Co.	564,975	913,587
Johns-Manville Corp.	5,733,000	6,967,861
Minneapolis-Honeywell Regulator Co.	4,143,615	4,995,083
Monarch Machine Tool Co.	208,225	235,350
Monsanto Chemical Co.	8,810,000	6,838,000
National Lead Co.	12,630,392	12,537,724

SELECTED MANUFACTURERS	1957	1956
Parker-Hannifin Corp.	461,506	335,706
Pittsburgh Forgings Co.	408,231	62,538
Pittsburgh Screw & Bolt Corp.	388,404	270,248
Pullman Inc.	3,701,716	2,244,288
Revere Copper & Brass Inc.	1,924,238	2,019,528
Reynolds Metals Co.	9,157,788	6,441,278
Rockwell Spring & Axle Co.	2,612,459	1,060,079
Union Carbide Corp.	34,000,965	33,578,938
Union Twist Drill Co.	451,400	434,400
U. S. Pipe & Foundry Co.	2,626,383	2,899,251
Vertol Aircraft Corp.	284,811	858,612
Worthington Corp.	2,367,112	2,338,480

Steelmakers Do Well, Too

SELECTED STEELMAKERS	(First nine months)* 1957	1956
Alan Wood Steel Co.	$710,178	$2,041,754
Allegheny Ludlum Steel Corp.	9,725,952	9,647,024
Colorado Fuel & Iron Corp.	12,200,223	9,081,359
Continental Steel Corp.	2,216,785	2,199,774
Crucible Steel Co. of America	5,820,877	8,597,020
Inland Steel Co.	43,146,628	35,490,480
Jones & Laughlin Steel Corp.	37,970,000	32,269,000
Lone Star Steel Co.	9,439,862	6,891,540
Republic Steel Corp.	73,039,194	55,838,400
Youngstown Sheet & Tube Co.	31,814,556	24,904,000

*3rd quarters aren't comparable because of strike.

But Outlook Less Promising

METALWORKING has three reasonably profitable quarters under its belt, but it may have to tighten up for leaner earnings in the last three months.

Steelmakers' hopes for a fourth quarter as profitable as the first three have been dampened by a scattering of operating cutbacks. Many companies are running at below 80 per cent of capacity.

Downtrend?—Additional factors making the last quarter profit picture look less promising: 1. Hand-to-mouth buying. 2. Cautiousness. 3. Generally lower backlogs. 4. More start-up expenses. 5. Rising overhead costs. 6. Aircraft cutbacks. 7. Still some weakness in price structures.

Upturn?—But some signs point to a better profit picture. Orders are trickling in at a somewhat faster rate, especially those going to automotive suppliers. Price increases will be in effect for the full three months. Inventories have been cut enough so that increased demand can mean an immediate pickup in orders. Christmas buying will help. Some automotive suppliers are predicting record fourth

quarters (though others report reduced backlogs).

Some industries, including steel, can show a better profit per sales dollar at slightly below capacity operations. Reason: Old equipment used to get full capacity has a narrow profit margin.

Or Leveling Off?—Most firms expect the profit curve to flatten, but not decline, in the fourth period. On the whole, this will be a good year. Some firms expect to set records. Here's how the last quarter earning trend looks:

Autos—Good turnover in stock of '57 models gives the period an initial boost. Orders from dealers for '58 models cause automakers and suppliers to be optimistic.

Aircraft—A noticeable decline in earnings begins to show as firms start the phasing out of models hit by defense cutbacks.

Nonferrous—Look for a continuation of the present level. An improvement in business in general would have an immediate beneficial result because of users' low inventories.

Steel—The long rise has peaked and ebbed. But the year will be better than 1956 because: 1. The strike hurt '56 earnings. 2. The first half of '57 reached high levels. 3. Higher prices and lower cost of scrap will help.

Capital Goods — A "wait until next year" attitude is common (see STEEL, Oct. 21, pp. 42-43).

Appliances — A slight fourth quarter upturn is likely as dealers stock up for Christmas buying.

Office Equipment—Watch for a continued rise. Backlogs in some cases are not as high as they were, but they are still at healthy levels.

For '58—Manufacturers had a 17 per cent return on net worth in 1947, but only a 13.9 per cent return last year. Selling prices are not increasing as rapidly as labor and other costs. Prospects are that the long-term erosion of profits will continue next year.

Caster Spends $1 Million

American Cast Iron Pipe Co., Birmingham, will open a $1 million centrifugal steel casting facility in mid-1958. The production building contains 100,000 sq ft. Size of the machine shop will be tripled.

Builder Hits Slump Talk

"WHEN the machine tool business is good, it is plenty good, and when it is bad, it is still pretty good."

Jerome A. Raterman, outgoing president of the National Machine Tool Builders' Association, uses those words to take issue with the industry's feast-or-famine reputation.

"We have always had fluctuations in volume in the machine tool business, and yet we have gone right on earning a profit," he declares.

How's Business? — Talking to association members at last week's annual meeting in French Lick, Ind., Mr. Raterman, president, Monarch Machine Tool Co., Sidney, Ohio, estimated shipments for 1957 at $800 million. "The figure has been exceeded in only four of the last 13 years—and three of those four years reflected national defense demand due to the Korean crisis."

Mr. Raterman admitted that the dip in new orders is greater than he foresaw last spring. In September, they came to $28.9 million. The average for July, August, and September was about $43 million a month.

Viewpoint — Such results are good or bad, depending on how you look at them. Compare them with peak years, and they're bad. Mr. Raterman suggests comparison with other peacetime periods. "From 1946 to 1950, and 1955 and 1956—seven years during which the industry had practically no carryover from defense emergencies—our production averaged $434 million a year, an amount considerably below what we can expect today, if new orders continue at the present rate," he stated.

He cited these reasons for confidence:

1. Figures on age and obsolescence of machine tools on plant floors indicate an enormous potential replacement market.
2. Beyond that market lies demand for machine tools needed in expansion projects which have been delayed but not abandoned.
3. The rate of research and product development within the machine tool industry.

New NMTBA Officers

President
ALFRED V. BODINE
Bodine Corp. president

1st vice president
RALPH J. KRAUT
Giddings & Lewis president

Compare Your Job Relationships

HERE are 18 jobs selected at random from 81 included in an American Home Laundry Manufacturers' Association study. It's designed to show how members ranked jobs within their wage structure. The survey included 18 firms.

Note the variance in the relative position of each job within each firm's wage structure, compared with the industry average. None of the 18 companies' job relationships coincided exactly with the average.

The significance of the study, say consultants at Edwin Shields Hewitt & Associates who assisted in the research, is that each firm can analyze its own "out-of-line" jobs. Small variations are normal. Where variations occur which are wide, management must analyze its situation to determine whether the relative job position is justified.

***Example*—Companies B and C appear to be rating their electricians "A" too high. A local shortage of electricians or some other circumstance might justify the relationship. Or the firms' job evaluation methods might be faulty, and they are paying too high a rate.**

Wage Paid Expressed as Percentage of Each Firm's Average Straight Time Pay

Job Description	Industry Average	Company A	B	C	D	E
Janitor	80%	78%	75%	73%	83%	81%
Paint booth cleaner	86	82	80	75	103	80
Loader	90	95	86	82	88	112
Receiving checker	93	90	98	98	95	96
Visual inspector	95	92	84	97	95	90
Stock chaser	98	85	†	106	95	82
Receiving inspector	99	88	95	102	100	99
Dinger	103	119	†	128	†	110
Drill press operator	104	111	†	100	122	100
Burrer	105	108	112	81	112	97
Shear (set up & operate)	106	99	103	116	85	120
Milling machine operator	108	114	109	102	128	97
Welder, arc or acetylene	109	†	†	136	103	103
Boring machine	110	116	112	98	127	105
Punch press, setup man	111	106	115	117	109	132
Electrician "A"	113	113	135	136	113	102
Grinder, rotary-surface	117	113	112	117	134	110
Tool, die, or gage maker "A"	128	119	121	136	138	114

Source: American Home Laundry Mfrs. Assn.
†No jobs in this classification.

Job Rating: Profit Saver

HOME LAUNDRY equipment makers' widely varying wage scales aren't exceptional. Metalworking abounds with examples—causing unequal labor costs and profit losses.

Why the variations? Geography and related special circumstances account for some. But those causes are becoming less important. Improper job rating increasingly is the culprit.

Rule of Thumb—Experts in job rating suggest giving a higher weighting—50 per cent—to skill (education, experience, initiative, ingenuity); a higher weighting—25 to 35 per cent—to responsibility (for equipment, materials, and safety of others); and a lower weighting—15 to 25 per cent—to physical effort and working conditions.

To update their job rating methods, companies are breaking down each basic category into several factors, as above. They're establishing point systems for better comparisons of jobs.

Writing the Job—National Metal Trades Association, which does job rating for member firms, uses 11 factors and a point system of five degrees for each factor. "But writing the description of the job to be rated," says NMTA Commissioner George Earl, "is equally important." (See Page 122 for sample.)

That's especially important with a new job. Many firms have found their rating methods are obsolete because technology changes the duties of a job or creates a completely new one. Major shortcoming: Too few factors to "slot" a new job accurately into the wage structure.

Advice — Guard against union pressure to overemphasize the "responsibility" factors in new jobs involving expensive equipment, possible costly production losses, and safety of others. Here are two considerations:

1. How well protected is the equipment with safety devices, such as automatic shutoffs, which limit the employee's responsibility?
2. How much ingenuity, as opposed to normal attentiveness to a few rules and details, does the job require?

Keep Current—Industrial rela-

tions people differ over details used in job rating, but they're unanimous in this: Once you've rated your jobs, don't expect your standards to last forever. How often you must re-rate depends on these changes since the last review: The number of wage increases and other concessions to labor; the number of new or modified jobs created; shifts in production levels, which create different tasks for workers.

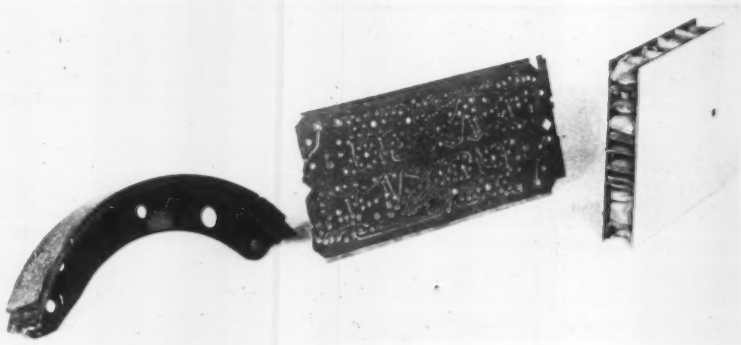
If kept up to date, job rating can: Provide an accurate method of evaluating new or modified jobs; avoid wage inequities and, consequently, labor grievances; help keep your labor costs competitive.

Job Description

Don't spare the details. Take this sample for a toolmaker, Class B:

"Lay out, construct, alter, and repair a variety of tools, including ordinary combination, blanking, piercing, drawing, bending, and forming dies; box and stand type drill jigs; milling and other fixtures for general type machining operations, plus location and profile gages where design is available but ordinary development work is required. Visualize finished job, make necessary mathematical calculations, and select allowances for spring, shrinkage, lapping, grinding, scraping, fitting, and finishing. Recognize and report blueprint errors for correction (such as improper angles, radiuses, and materials) which would prevent economical production. Perform difficult and exacting machining operations requiring a wide variety of setups and methods to maintain close tolerances, as well as skilled benchwork involving filing, scraping, grinding, lapping, fitting, assembling, and adjusting to insure satisfactory performance. Make tool tryouts, detect faulty operation or defective material, and correct trouble."

• An extra copy of this article is available until supply is exhausted. Write Editorial Service, STEEL, Penton Bldg., Cleveland 13, Ohio.



Adhesive-bonded brake lining (left) was one of earliest metalworking applications. Adhesive used to bond printed circuit (center) must withstand hot solder bath at 550° F. Curtain wall panel (right) is gaining popularity

Adhesive Markets Multiply

Metalworking is the fastest growing customer of this rapidly expanding industry. Other markets and new bonding techniques insure greater growth

"SINCE 1947, adhesive sales have grown tenfold," states Bernard Gould, manager of market development, Rubber & Asbestos Corp., Bloomfield, N. J.

Over 100 manufacturers sell over 1000 types and have an annual volume of over $100 million. At least 15 new firms have cropped up the last two years.

Cars First—Car builders were first to find a metalworking use for adhesives, says Minnesota Mining & Mfg. Co., Detroit. Top fabrics, upholstery, and running board mats were bonded on early autos.

Cycleweld Div., Chrysler Corp., began bonding brake linings in 1948. All Chrysler cars have used them since 1950. Other automakers followed suit. Cycleweld also bonds clutch plates, tractor power take-offs, and washing machine parts.

Other automotive uses: Truck bodies, door panels, weather strip, trim, carpet, and sound deadener pads.

Aircraft Biggest—The aircraft industry uses high strength adhesives to bond wings and helicopter rotor blades, to attach skins, and to make spars, webs, and other heavy members. Furane Plastics Inc., Los Angeles, reports that epoxy-phenolics, having 7000 psi tensile strength and 10,000 psi compressive strength, are being used by planemakers.

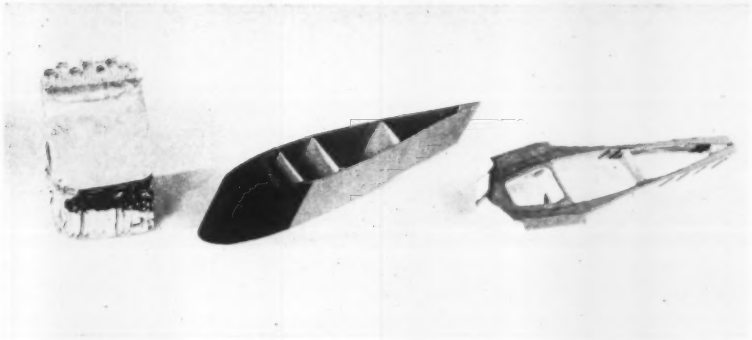
Others Users — The appliance, furniture, electrical, insulation, heating and air conditioning, building, and railroad industries also use adhesives.

They're Versatile—Most adhesives are made for a specific usage. But slight changes in composition, application, or curing procedure adapt them for other purposes, says Minnesota Mining. Reports B. B. Chemical Co., Cambridge, Mass.: "A fast growing use is bonding linings to tanks for holding corrosive materials."

Minnesota Mining adds: "Aluminum and magnesium can be joined more strongly by adhesives than by any other method."

They're Strong—Eastman Kodak Co. claims one drop of its new liquid adhesive, bonding the ends of two 2-in. steel rods, will lift 5000 lb after 30 minutes curing time.

Advantages—Adhesives can:



Among the fastest-growing metalworking applications for adhesives are honeycomb structures (left) and helicopter blades (two cross sections at center and right). Above samples courtesy of B. F. Goodrich Industrial Products Co.

- Join dissimilar metals.
- Eliminate high temperature needed to weld or solder.
- Fasten thin metal sheets.
- Act as a sealer.
- Damp vibration.
- Provide a heat or electricity insulating layer.
- Uniformly distribute load.
- Allow smooth surface contours.
- Cut down on specialized labor.
- Reduce weight.
- Usually increase service life.
- Permit fast assembly.
- Give great strength.
- Allow automatic assembly (parts can be sprayed with adhesive at one point in assembly line and joined at another).
- Protect against corrosion.
- Allow more intricate design.
- Permit use of lightweight metals because greater area of bond increases rigidity.
- Eliminate protrusions: Improve aerodynamics, enhance appearance, aid styling, eliminate gaps and bulges.
- Maintain soundness of structural members: No holes or countersinking.
- Aid production flexibility.

Limitations—On the other side of the ledger:

- Investment in jigs, fixtures, ovens, autoclaves, or presses is often necessary.
- Stability at elevated temperatures is limited.
- Long drying times are often required.
- Peel strength is often low, while sheer, tensile, and creep strengths are often high.
- They are flammable.
- Products sometimes require redesign.
- Bonds usually can't withstand extreme shock.

Cost—The price per pound in 1000-lb lots varies from about 14 cents for some elastomeric reclaim rubber compounds and thermosetting urea formaldehydes to over $5 for some epoxies and resin blends.

Price per gallon varies from 50 cents to over $30, reports Permacel Tape Corp., New Brunswick, N. J. Tapes cost $1 to $2 per square foot, says Shell Chemical Co., New York.

Application — Epoxies are nonvolatile liquids and are applied with a knife, brush, or notched trowel. Modified vinyl phenolics and phenolic elastomers are applied as films or solutions.

Many Varieties—There are over 25 basic types of adhesives in commercial use, each of which can be modified to serve numerous purposes.

Armstrong Cork Co., Lancaster, Pa., sums it up: "No 'general purpose' adhesive exists." But by varying the selection of thermosetting and thermoplastic resins, elastomers, and fillers, properties can be greatly modified—including flexibility, temperature resistance, exposure resistance, shear strength, dead load strength, and peel strength.

Mag: 2000 A.D.

By then use will amount to several million tons yearly, association is told by researcher

BY 2000, production and consumption of magnesium will be at the annual rate of several million tons, delegates at the Magnesium Association convention in New York were told.

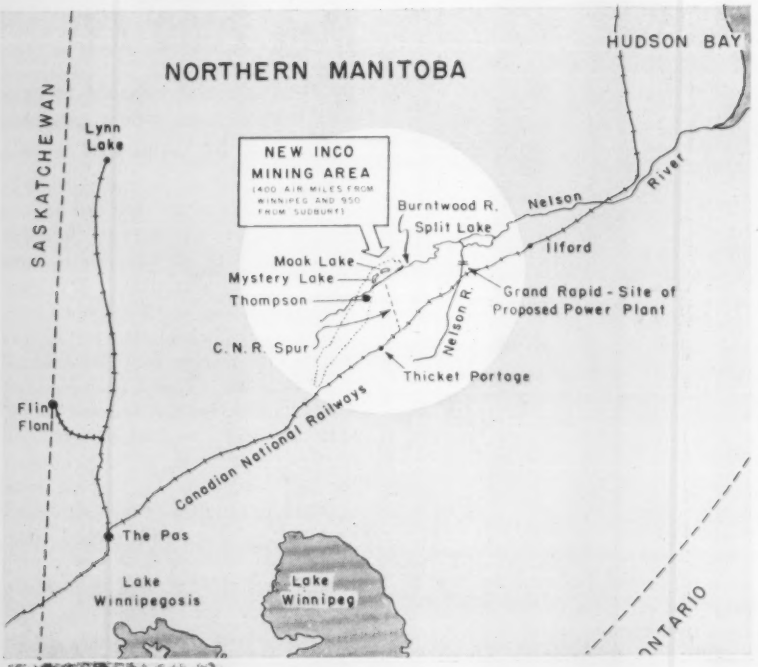
Dr. R. M. Brick, director of research-metallurgy for Continental Can Co. Inc., New York, added that no foreseeable demand could seriously dent availability of the metal. "If it were to be produced for 100 years at the current rate of steel production, the ocean content (of magnesium) would only drop from 0.13 to 0.12 per cent."

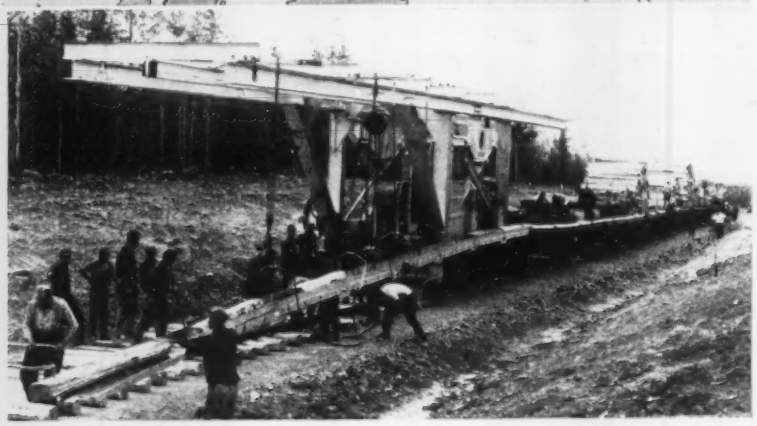
A Prospect—The can represents a potential for magnesium, Dr. Brick believes. Here's why: "Aluminum is expected to make strong inroads into this industry traditionally dominated by tin plate. But look for 3 per cent magnesium to be added to aluminum to make can production more economical. It could mean as much as 30,000 tons of magnesium would go to the can industry yearly (if the prediction of an annual consumption of 1 million tons of aluminum by the can industry holds up)."

Dr. Brick said more and more magnesium will be used where: 1. Lightness is most important. 2. Fabrication cost is more important than the base cost of the metal. 3. High strength-to-weight ratio is necessary.

Requirements—Several speakers warned that the metal's future will depend on how good a job of development and selling the industry does. Said John H. Rizley, Convair Div. (San Diego, Calif.) of General Dynamics Corp.: "Due to its lightness, magnesium will be in demand in future aircraft and missile structural design so long as the development of new alloys keeps pace with competitive metals. At present, magnesium alloys hold a slight advantage on a strength-to-weight and stiffness-to-weight ratio basis."

Said A. G. Cole, Magnesium Elektron Ltd., London, England: "What is required is a more complete documentation of magnesium uses."





30-mile railroad spur opens up nickel deposits in Manitoba

Inco Expands in Canada

COMPLETION of a 30-mile railway through rugged terrain in northern Manitoba has opened the way for shipments of nickel from what will become the world's second largest producing facility.

The $5-million track links International Nickel Co. of Canada Ltd.'s extensive ore holdings in the Mystery-Moak Lakes region with the main Hudson Bay line of the Canadian National Railways.

Inco is sinking shafts for two mines (Thompson and Moak) 400 air miles north of Winnipeg. Ore from the Moak mine will be transported to Thompson over a 22-mile railroad spur. Although three times as much ore will eventually come from Moak, emphasis at first is on Thompson because its ore is richer.

Integrated—When completed in 1960, the facility will be fully integrated. Under construction at Thompson are a milling plant, smelter and refiner. Production of refined nickel will be at a rate of 30,000 tons annually by June, 1960; 37,500 tons by the end of that year.

Spokesmen hint that ore production will continue well past 2000. Preliminary drilling indicates some deposits go down 3000 ft. Another factor: Nickel content of the Mystery-Moak Lakes ores reportedly runs 1 to 4 per cent higher than it does at Inco's largest mine at Sudbury, Ont.

Other deposits may be found in the Manitoba area. Inco's holdings include some 300,000 acres (the Mystery-Moak development is 80 miles long and up to 10 miles wide).

Cost—Inco will spend $115 million to develop the facility before the first pound of ore is removed.

A town of about 8000 will spring up on the Burntwood River, a few miles from the Thompson mine, to house the influx of 2000 workers and their families.

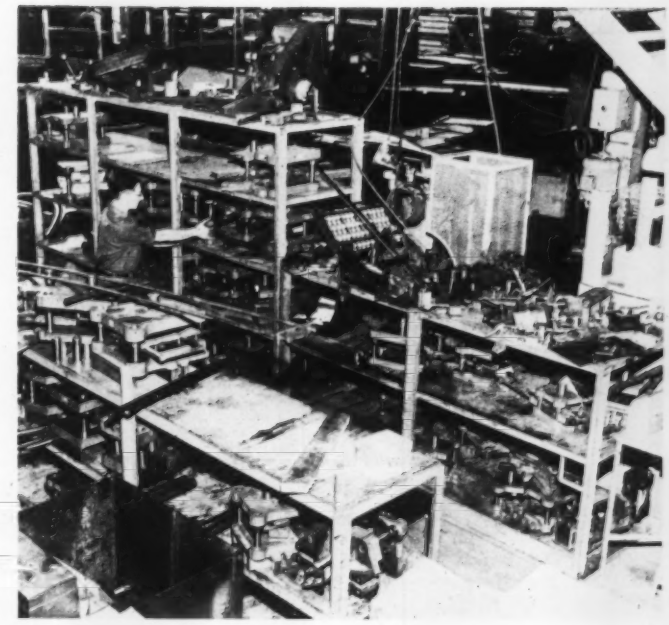
Troubles?—The new mines will push Inco's production capacity to 192,500 tons annually by 1960, about 50,000 tons more than it had in 1956. Free World nickel production by the end of 1960 should reach 317,500 tons, compared with around 214,000 tons in 1956. But demand is off this year, and indications are that 1958 won't be much better.

Earlier this year, Inco asked the Office of Defense Mobilization to take some of this new production for stockpile. The government refused. In a more recent development, ODM informed all producers that it did not want to take any nickel for stockpile in 1958 (STEEL, Oct. 14, p. 204).

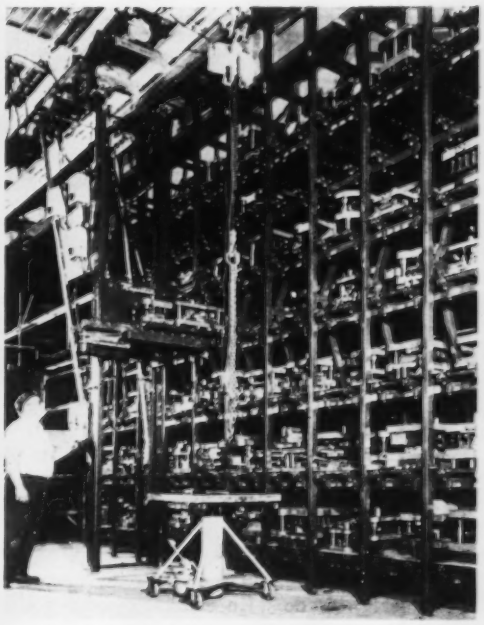
It means nickel producers will have to step up development of civilian markets.

Gets Air Force Contract

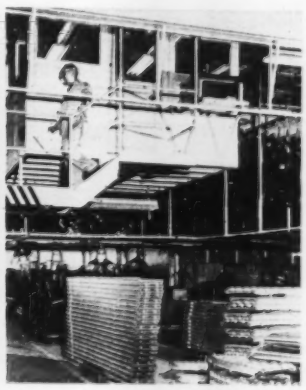
Lockheed Aircraft Corp., Burbank, Calif., will seek ways to put metalforming with high explosives into production use for the Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio. The method has been hailed as the answer to practical handling of extratough metals.



Before: Dies were stored on steel benches only 4 ft high, covering 375 sq ft. They had to be lifted, slid, or carried



After: New racks use only 170 sq ft, and dies are easily accessible by overhead transfer or hoist



Point-of-Use Storage: Example is Flow Rack accumulator (left). Tote boxes are pushed into rack from lift truck and pulled out on other side at assembly line. Overhead offices save space (right)

RESULTS:

1. **Practically eliminates overtime.**
2. **30% greater efficiency.**
3. **50% more production capacity.**
4. **Saved $200,000 vs. cost of plant addition.**
5. **Saved $400,000 on inventory in one year.**
6. **Quicker turnover of materials.**
7. **Faster shipping.**
8. **Simpler accounting.**
9. **Plant works as lab and showcase.**

Technics Takes Over

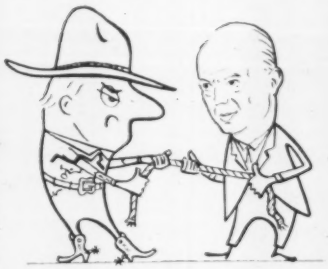
IN AN AGE of shrinking profits, the art of co-ordinating material handling (termed technics) allows small companies to increase productivity without expensive plant additions.

It permitted Rapids-Standard Co. Inc., Grand Rapids, Mich., to increase profits while holding price raises below the industry average, says James R. Sebastian, R-S president. The firm is among the top ten material handling equipment makers. Says Mr. Sebastian: "We simply decided to use our own products to best advantage."

How It Works — Movement, transfer, accumulation, and control are the key areas of efficient material handling. By redesigning storage to take less space and be at point-of-use, R-S licked the first problem. Automatic conveyors, Flow Racks, easy access roll-out shelves, and relocated aisles solved the second problem. IBM cards helped accounting and control.

Example—In the small parts welding department, tools are hung on an overhead conveyor which circles the area. When a worker needs a jig or fixture, he pushes a button; the conveyor circles until he can select the item he wants. Result: 2000 sq ft of floor space saved. Photos show other examples.

New Tug of War: Ike and Congress



THE ADMINISTRATION is gathering its forces for an all-out push in 1958 to keep foreign trade high. While foreign trade of the U. S. stands at a record annual rate of over $30 billion, President Eisenhower doesn't want anything to slow its continued growth. Two matters which could affect it come up next year in Congress: 1. Renewal of the Reciprocal Trade Agreements Act. 2. Appropriations for foreign aid.

Henry Kearns, assistant secretary of commerce for international affairs, estimates over 4 million American families gain their income almost entirely from foreign trade. He thinks exports will hit the $20-billion mark this year, compared with $17.3 billion last year. Imports amounted to $12.7 billion in 1956. Those figures do not include military programs.

Here's where foreign nations get U. S. dollars to buy U. S. exports (1956 figures): 1. U. S. imports worth $12.7 billion. 2. Tourist spending of $4 billion. 3. Industrial investments of $2.7 billion. 4. Military spending of $3 billion. 5. Government loans of $2 billion.

Foreign Trade: A Two-Way Street

Any slowdown in exporting that money will work a hardship on our export business, say Ike's top advisers. Vice President Nixon is calling for a five-year extension of the Reciprocal Trade Agreements Act, which, since 1934, has reduced import tariffs as much as 75 per cent on some goods.

Under GATT, the General Agreement on Tariffs & Trade with 37 nations, escape clauses permit a country to raise import duties or limit imports when the domestic industry is threatened. The administration wants Congress to O.K. our participation in OTC, the Organization for Trade Co-operation, an outgrowth of GATT, which will "provide a forum to discuss international trade policy," Mr. Kearns notes. Congress turned it down last session because of its internationalism flavor, but Ike is hoping to push it through next year as the only means through which the U. S. can continue to promote trade to the extent that it has in the last few years. Without OTC, Mr. Kearns hints GATT will break down.

But Congress Wants To Keep Control

The leading Congressional point of view: Agreements like GATT could be handled as well by foreign trade committees and subcommittees.

Although not necessarily representing the majority of Congress, the watchdog on Capitol Hill is Rep. Hale Boggs (D., La.), who heads the Foreign Trade Policy Subcommittee of the House Ways & Means Committee. Available now to interested parties: An 1157-page compendium of views on foreign trade prepared by the subcommittee's staff. From Dec. 2 to 14, the subcommittee will hear witnesses in Washington who wish to add to or disagree with the views expressed in the compendium. "Early in the next session," says Representative Boggs, "the subcommittee will issue recommendations for legislation."

The Outlook

Foreign aid will have rough going next session. Congress cut $600 million out of Ike's request for $3 billion last session. With the Defense Department expected to ask for $40 billion in new money for fiscal 1959 (and Congress probably willing to give it more than that), foreign aid will be the easiest place to economize. (Aid cuts don't hurt too many constituents.) Look for the Trade Agreements Act to be extended—but for only three years.

National Security Clause Will Stay

Some industries, via recognition of their national security status by the Office of Defense Mobilization, have been able to get around what they describe as "ruinous" foreign competition. Look for a thorough study of these cases, with the nonferrous metals getting some special attention from the Ways & Means Committee. Representative Boggs was the most vocal member of the committee last session in refusing tariff help for the lead and zinc industries. He cited ODM's failure to help through the national security ruling as indicative of the lack of need for any aid. Chances are that his subcommittee will favor restricting ODM's power in this area, but Congress as a whole will probably stand back of the ODM.

With copper and lead both banging at the Tariff Commission's doors, you can reasonably expect mineral state congressmen to fight hard next session over our foreign trade policy, but no one thinks we are turning back to the old protectionist days.

Meet Russell H. Hughes: He's assistant director for production, Office of Defense Mobilization. Like recently appointed Defense Mobilizer Gordon Gray, Mr. Hughes is an ex-Pentagonian. At the Defense Department, he was assistant director for production policy in the office of the assistant secretary of defense for supply and logistics. Mr. Hughes retired from New York Telephone Co. as a vice president in 1955.

McKay ROLLER LEVELERS

. . . From Tin Plate to Ship Plate

Tin cans and super-tankers have more in common than cargo space — the flat steel of which they're made had to be roller leveled. Regardless of the product — cans, cars, planes, appliances or ships — more fabricators will tell you that the "buy-word" in roller levelers is McKay. Write for Bulletin 100, or call for a McKay Application Engineer today.

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Here's another plea for tax depreciation reform to . . .

Make Paper Profits Real

BY 1960, the U. S. steel industry will have to use $600 million from "profits" to replace plant and equipment, says Rev. William T. Hogan, director of industrial economic research at Fordham.

In 1956, industry's depreciation charges amounted to $743 million. Yet about $400 million had to be taken from "paper profits" to replace plant and equipment because tax laws base depreciation on original, not replacement, costs.

Increase Explained—The prediction for 1960 assumes: 1. Inflation will continue. 2. The steel industry is growing, so replacement will grow. 3. Depreciation accruals will remain almost constant. Large portions of present accruals come from rapid amortization. By 1960, these funds will be practically depleted, offsetting the increase in normal depreciation funds.

The Problem — At its present rate of profit, it would take the steel industry 13 years to replace its assets, adjusted to current prices, if every cent were plowed back into the business.

The construction dollar has fallen to less than 40 per cent of its 1940 value. Equipment installed for $1 million in 1940 costs about $2.5 million to replace today. Depreciation set-asides on it come to only $1 million. Replacement takes an additional $1.5 million out of declared profit—on which income taxes have been paid.

Examples — Reverend Hogan cited several cases in addressing a Pittsburgh meeting of the Association of Iron & Steel Engineers.

One firm, in replacing its worn-out facility between 1946 and 1955, had to supplement each dollar of depreciation accrual with $1.30 taken from earnings.

Added Difficulty—It might be argued that new equipment should be termed expansion instead of replacement, which would partially justify taking the cost out of profits. But Reverned Hogan says: "The industry must raise substantial funds in addition to its depreciation accrual just to keep its present plant operating."

Adequate depreciation in 1955 or 1956 would have reduced net profits to $800 million plus (versus declared profits of about $1.06 billion). Although the hypothetical figure still amounts to a record dollarwise, it is illusory because of inflation. For example, in 1916, the industry had net profits of $608 million, or around $1.5 billion in terms of 1956 dollars. Ingot production was 47 million tons in 1916, vs. 115 million tons in 1956.

Three Solutions—The basis of any solution must lie in some type of tax reform. Industry must recover the original cost of investment, not in dollars, but in purchasing power. The solution must be based on a flexible norm because: 1. The life span of a piece of equipment cannot be accurately predicted. 2. The valuation changes because of obsolescence and fluctuations in price level. Reverend Hogan mentions three solutions.

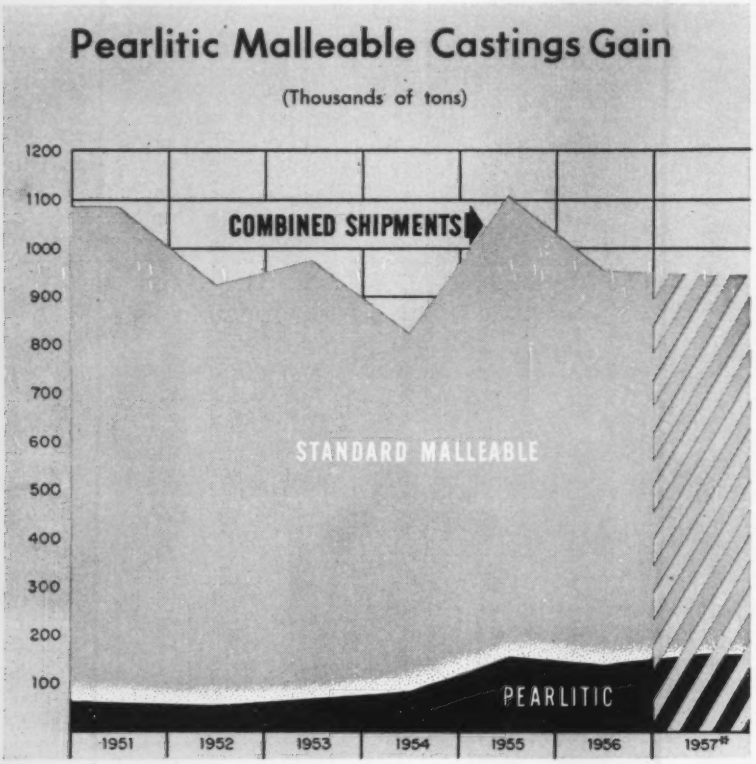
One—Total plant revaluation: Revaluate the total plant annually at a constant percentage of the depreciation charge. Example: A company valued at $1 million in 1957 takes 5 per cent depreciation, or $50,000. If the purchasing power of the dollar declines 2 per cent in 1958, the firm is revalued at $1.02 million and the company takes 5 per cent again. Depreciation this time is $51,000. On the same basis, 1959 depreciation would be $52,020.

Two—Individual asset revaluation: Depreciation is charged on each asset. It requires: 1. An index of inflation. 2. Determination of the life span of each piece of equipment. 3. Adjustment of the value of the equipment and the depreciation charge against it each year after the end of the first.

Example: Say an asset with an original value of $100 has a life span of five years. Add 10 per cent to the original value each year for inflation. Adjustments are made this way:

Inflation	Previous Allowance	Adjusted Value	Current Charge
$100	.....	.....	.....
110	.....	$110.00	$22.00
120	$22.00	98.00	24.50
130	46.50	83.50	27.83
140	74.33	65.67	32.84
150	107.17	42.83	42.83
			$150.00

Three—Lumping: Charge off, in the year in which equipment is replaced, the difference between the original cost of the asset and the actual replacement cost. The difference would be established by an index. It would not mean that an identical asset need be bought, but the purchasing power of the dollars originally paid for the item would be reclaimed.



Source: Bureau of the Census and Malleable Founders' Society.
*Estimated by STEEL.

Malleable Trends

- Development of new and improved grades of pearlitic malleable iron.
- Aggressive sales programs aimed at conversion of forgings, stampings, and weldments to castings.
- Conversion of standard malleable castings to pearlitic malleable in applications where greater strength is required.

Malleable Summary

Sales: Down 12 per cent.

Prices: Up 8 per cent.

Backlogs: "Nil" to two months.

Workload: 75 per cent of capacity.

Hours: 32 to 40 per week.

1958: About the same as 1957.

Main market: Automotive.

Standard Castings Decline

GIVEN a modest upturn in fourth quarter business, malleable iron founders could match their 1956 shipments of castings (951,868 tons). But they'll have to settle for less if buyers persist in hand-to-mouth ordering.

Despite an 8 per cent increase in production by the automotive industry, biggest foundry customer, shipments of malleable castings are 12 per cent behind last year's pace. Lowell D. Ryan, executive vice president of the Malleable Founders' Society, Cleveland, is scaling down his 1-million-ton forecast of last December. He expects 1957 shipments to hit 925,000 tons. "My first estimate was based on the assumption that we'd turn out 6.5 million cars," he explains.

Nonautomotive Sales Off—Although sales to auto and truck manufacturers have been satisfactory thus far, shipments to other markets are down about 15 per cent. There have been fewer orders from producers of agricultural machinery and tractors—customers who normally buy 7 per cent of the standard malleable castings. Makers of valves and fittings, distressed by construction cutbacks, are working off their inventories. Manufacturers of railroad freight cars are selling fewer cars and buying fewer castings. It's the same story for the road machinery industry, a group which takes 5 per cent of standard casting output.

A spotcheck of representative foundries indicates that business conditions vary from "same or slightly better than" to "12 or 15 per cent below" last year's sales. As a spokesman for a major midwestern foundry points out: "It just depends on who your customers are. If you're selling to Chrysler, you're probably well ahead of last year." If you sell to Ford, you may be out of luck. It's reported that the second biggest automaker has switched some castings from malleable, previously bought outside, to nodular iron, which it makes in its own shop.

Backlogs Down — Foundrymen say backlogs are lower than they were a year ago and leadtimes are "shorter than ever." While a few companies report two months' business on the books, as many say backlogs are "almost nil." Consensus: Buyers are working off inventories, ordering on a hand-to-mouth basis.

Says the owner of an Ohio foundry with diversified markets: "We're operating at better than 90 per cent of capacity, largely because sales to one big customer in automotive accessories are four or five times what they were a year ago." Less fortunate is the man who channels three-quarters

of his production to railroad freight car builders. He's operating at 65 per cent of capacity, and profits are down 10 per cent. If this year is below average in terms of profits, Mr. Ryan explains that "there are just too many companies running at 60 to 70 per cent of capacity."

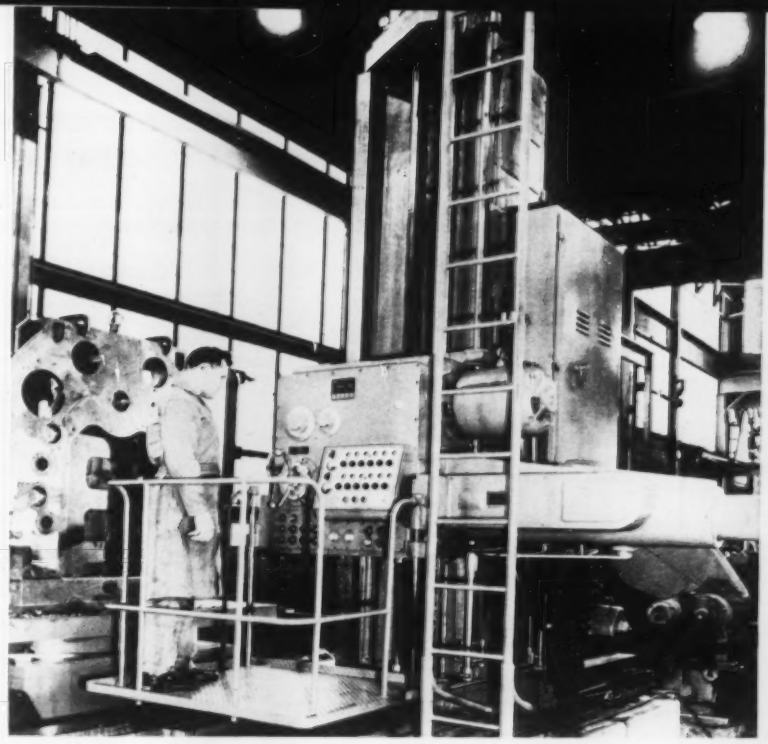
Costs Up — Although scrap prices are about $12 a ton lower than they were a year ago, the fluctuations since last October "complicated the business" of at least one foundryman, doing him more harm than good. No sooner had he reduced prices, he complains, than scrap went rocketing again, catching him with his profits down. The inflationary trend in the cost of other materials and in labor has been unabated.

As the malleable founders' costs have increased, so have their prices. Today's quotations are 5 to 10 per cent higher than they were a year ago.

Ace Card — In pearlitic malleable, a material noted for its high strength and hardness, foundrymen believe they have one answer to the problem of shrinking markets. Since 1951, members of the Malleable Founders' Society have increased pearlitic's share of total malleable shipments from 7 to 17.5 per cent. They've had conspicuous success in sales to the automotive industry, despite strong competition from forgings and nodular iron.

"There's plenty of room for expansion in sales of regular castings, too," says George T. Boli, president, Northern Malleable Iron Co., St. Paul. Urging foundrymen to sell more aggressively, he charges that "the trouble with many of the foundries is that their owners will invest $100,000 in new equipment but won't spend $50,000 on sales efforts." Last year, four of Mr. Boli's salesmen brought in 386 new jobs—conversions from weldments, stampings, forgings, and steel castings.

Outlook for 1958—Asked to comment on next year's sales prospects, one foundry operator replied: "I think we're all inclined to change our minds too abruptly. I have no reason to expect that next year will be much different from this one." There's a great deal of support for that view.



New binary code tape control system offers more . . .

Automation for Small Shop

SMALL machine shops can look forward to more automation. Tool builders are designing equipment to hurdle the cost obstacle.

Example: A new binary code tape control system for floor type horizontal boring, drilling, and milling machines by Kaukauna Machine & Foundry Div. (Kaukauna, Wis.) of Giddings & Lewis Machine Tool Co. Cost of the electronic system: $30,000 and up.

Cuts Steps—The control system is designed to eliminate layout work, scale and vernier reading, template making, and jig and fixture making. Kaukauna equipment uses three positioning methods for versatility: 1. Standard electric manual control. 2. Digital dial control. 3. Binary code tape control.

In digital control, the operator dials head and column dimensions taken directly from the blueprint. Pressing a "read-in" button transfers the dialed dimensions to visual light numbers for checking. He then presses the automatic traverse button and the machine positions itself.

On the Run—While machining in this location, the operator can dial the next operation and make his visual check. When machining is complete, pressing the traverse button will take the machine to the next position automatically. Electronic verniers indicate to 0.0001 in. the accuracy of the machine's positioning.

It is necessary in dial or tape control to adjust the measuring system of the machine to the location of the workpiece on the floor plate or table being used. It is done through automatic zero offset controls, after placing the spindle at a zero point.

Set Up on Typewriter—The punched paper tape is prepared on standard tape producing typewriters. From a standard engineering drawing, a manuscript or operation sheet is prepared, outlining the exact steps desired.

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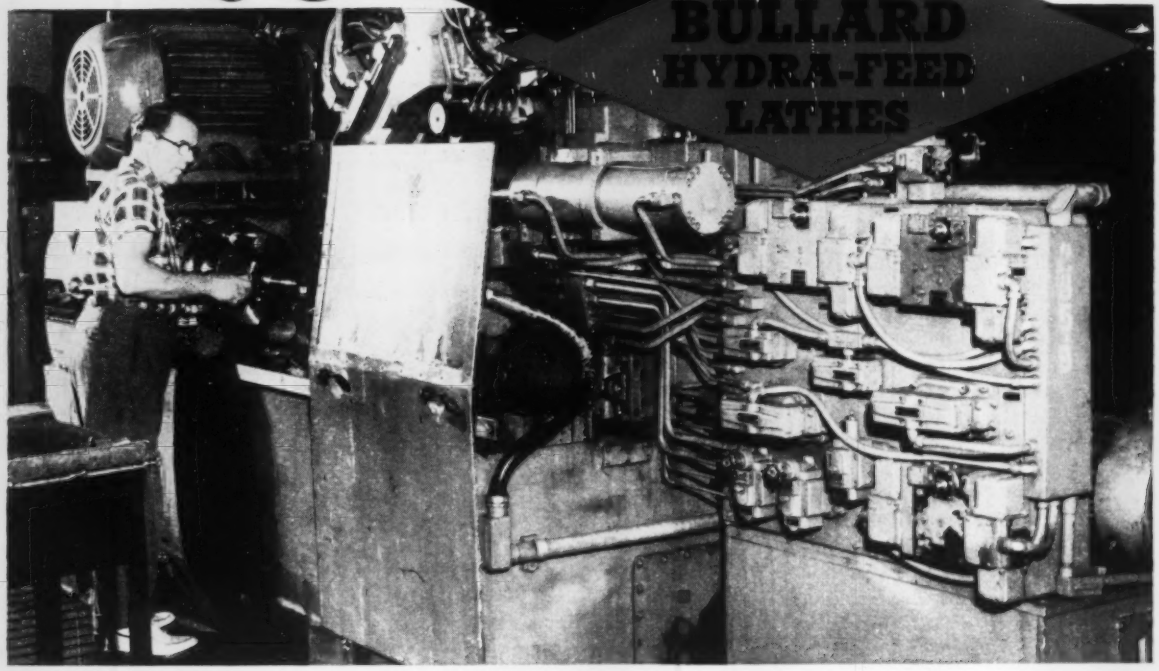
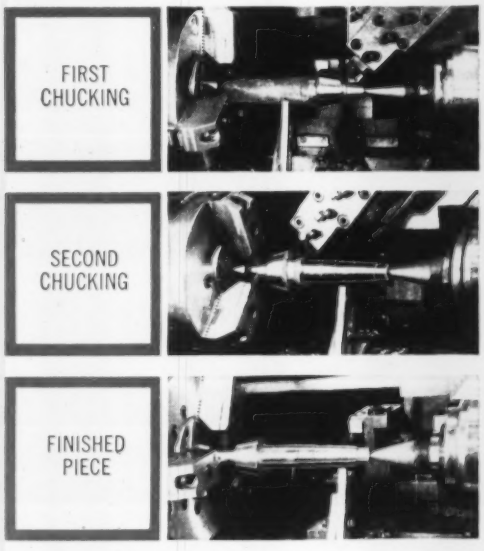


Illustrated below is one of more than forty different pinions processed on the same Bullard Hydra-Feed Lathes.

"Unless the consecutive set-ups from one job to another were similar," reports the Foreman of a large midwestern automotive parts manufacturer, "changeover set-ups took from ten to sixteen hours. But now, with Bullard Hydra-Feed Lathes, and going from one extreme to the other, **the changeover is accomplished in less than four hours.**"

Additional reasons for their enthusiastic acceptance of Bullard Hydra-Feed Lathes include less spoilage, greater accuracy, better finishes and reduced machining time over previous method.

These advantages can be applied to your machining requirements. Call your nearest Bullard Sales Office for full particulars or write



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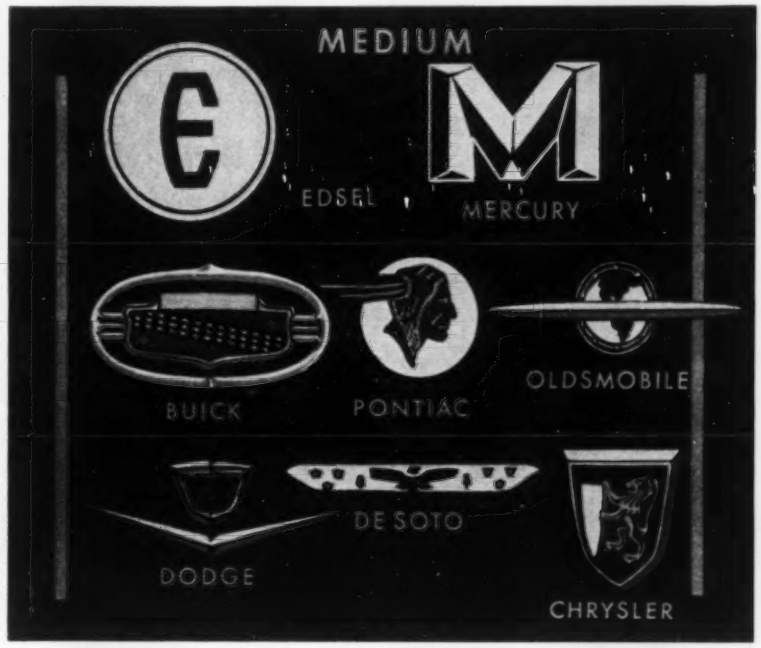

Medium Price Market Hit

Car buyers turn away from the middle priced class of autos. Builders will try to recapture sales in that range with more lines and accessories, but they'll find opposition strong

WITH SALES of medium priced cars down 11.7 per cent from last year's, this segment of the industry is in for a tough fight to boost its share of the market in 1958.

Medium priced cars are taking 31.14 per cent of the market, says *Automotive News*. That's 4.1 points below last year's figure.

The trend has gone like this in recent years: Buyers first shifted from medium priced cars into the more expensive low priced series. The heaviest buying this year is in the center of low priced groups. Economy models (including foreign jobs) seem to be in for a bigger share of sales.

What's Medium?—Traditionally, the industry follows the four price group classifications established by R. L. Polk Co., Detroit.

Low priced cars include Ford, Plymouth, Chevy, Dodge, and Rambler 6-cylinder models, Studebaker Champions and Commander V-8s. Imported economy cars are also in this class.

Polk's low medium and upper medium brackets exclude Buick Limiteds and Roadmasters, Chrysler New Yorkers, and Packards. They are added to the high price group (Lincoln, Cadillac, Imperial, and Continental). Sports cars generally fall into the upper medium grouping.

To Each His Own—Although sales figures indicate a market drop, Polk registrations for the first eight months of the year show that medium priced cars are taking 37.4 per cent of the market, some 3.2 per cent more than they did in 1956.

Registrations are not sales, however, and it's expected revisions will show the usual market drop.

Divisions Differ—Other interpretations of the medium price market run like this:

S. E. Knudsen, Pontiac's general manager, claims sales of this group are down about 14.31 per cent from last year's.

Jack Wolfram, Oldsmobile's general manager, says sales of medium priced vehicles are off "just slightly." He adds that for 11 years (through 1956) the medium price market annually has accounted for an average of 32 per cent of total sales.

Results Same—But no matter how you figure, medium priced cars are in a squeeze play. Buyers apparently would just as soon purchase a lower priced car loaded with accessories as a medium priced car having the bare necessities.

The industry is well aware of another factor: When business is cautious, buyers are in no mood to move into a higher priced car bracket—if they buy at all.

Right now, predictions for 1958 are on the conservative side. The industry may find that many who bought cars on credit in 1955 won't return to the market as expected.

Strategy—To woo more sales away from the low and high price fields, Ford has introduced Edsel with a price spread of $2519 to $3801 (factory list). Mercury has upgraded its line by adding the luxury Park Lane series. Pontiac is after the sports car lovers with its Bonneville series. American Motors has lowered prices on its Rambler Ambassador in an effort to increase its share of the market.

It sounds like medium priced cars are in for a sales upturn, but plenty of opposition is being readied in the low price circuit.

Opposition — Ford's Fairlane still is considered in the low price group although with all accessories it costs as much as an Oldsmobile 88 or a Dodge. Until price

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Chrysler Introduces Imperial

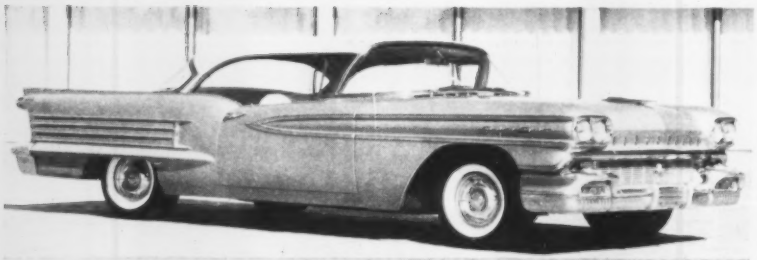
ENGINE

Type: V-8	Carburetor: Four barrels
Displacement: 392 cu in.	Torque: 450/2800 rpm
Compression ratio: 10:1	Horsepower: 345/4600 rpm

DIMENSIONS

Wheelbase: 129 in.	Width: 81.2 in.
Length: 225.8 in.	Tires: 9.50 x 14
Height: 57 in.	*Axle ratio: 2.93:1

*With TorqueFlite; 3.15:1 with air conditioning.



GM Introduces Oldsmobile's Dynamic 88

ENGINE

Type: V-8	Carburetor: Two-barrel Econ-o-way
Displacement: 371 cu in.	Torque: 390/2400 rpm
Compression ratio: 10:1	Horsepower: 265/4400 rpm

DIMENSIONS

Wheelbase: 122.5 in.	Width: 78.5 in.
Length: 208.2 in.	Tires: 8.50 x 14
Height: 56.97 in.	*Axle ratio: 3.08:1

*With Hydra-Matic; Synchromesh is 3.64:1.

groups are re-evaluated, the Fairlane and Chevy's Impala series will be knocking on the medium price class door.

In addition, lower priced cars are offering more accessories and options than ever before in an effort to attract prospects. And the imported economy models are expected to take a larger share of the '58 market (see STEEL, Oct. 14, p. 80).

Outlook—It will be particularly interesting to watch how the sales battle shapes up between Mercury and its family rival, Edsel. Some industry seers are saying they won't be surprised if Mercury is upgraded right out of the picture in a few years if Edsel catches on.

In 1958, medium priced cars will do well to hold their own.

Exhaust Notes

• Many of the Buick series will be using twice as much aluminum on 1958 models, reports Edward T. Ragsdale, division general manager. Some of the luxury series will carry up to 95 lb of aluminum, compared with 50 lb in 1957. One of the 74 aluminum items for Buick is its 26-lb Flight Pitch Dynaflow transmission case.

• Harlow Curtice, GM's president, says Vauxhall Motors, Luton, England, will produce 160,000 cars this year. More than 50 per cent of them will be sold in export markets. Next year, Vauxhall Victor will be marketed through Pontiac Div. dealers; projected schedules call for imports of about 1000 a month.

• White Motor Co., Cleveland, says there's an industry-wide sales slump of about 15 per cent in heavy duty trucks this year. As a result, the firm is cutting back its No. 1 line to 28 trucks daily from previous scheduling of 36 units.

U. S. Auto Output

Passenger Only

	1957	1956
January	642,089	612,078
February	571,098	555,596
March	578,826	575,260
April	549,239	547,619
May	531,365	471,675
June	500,271	430,373
July	495,629	448,876
August	524,354	402,575
September	274,265	190,716
9 Mo. Total	4,677,136	4,234,768
October		389,061
November		581,803
December		597,226
Total		5,802,808

Week Ended	1957	1956
Sept. 21	52,365	35,652
Sept. 28	51,552	43,369
Oct. 5	21,975	59,367
Oct. 12	38,626	70,175
Oct. 17	71,375†	88,557
Oct. 24	95,000*	104,269

Source: *Ward's Automotive Reports.*
†Preliminary. *Estimated by STEEL.

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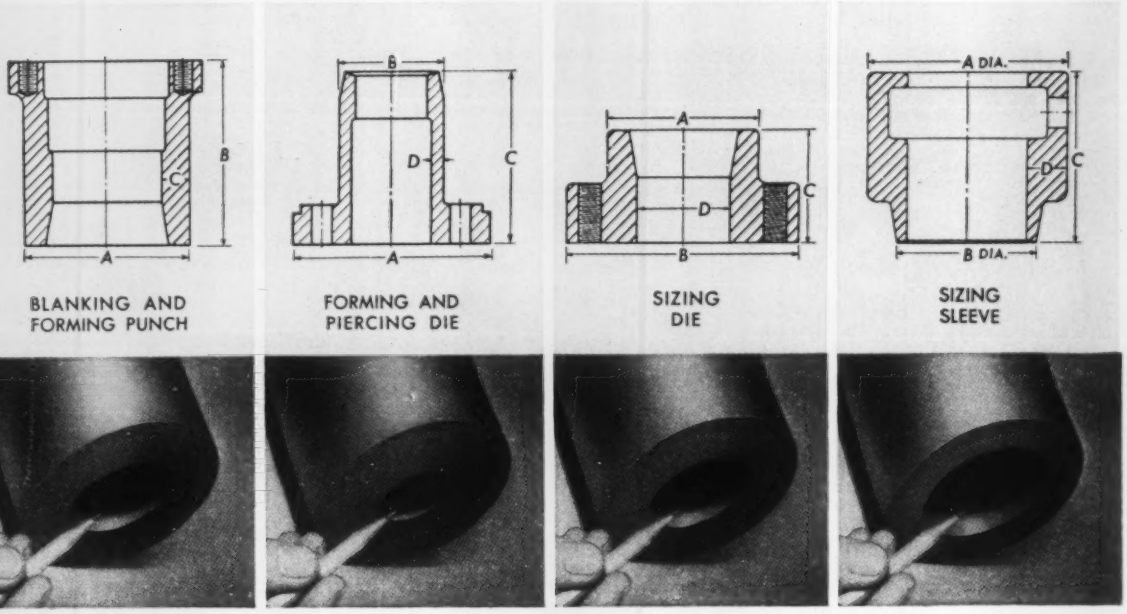

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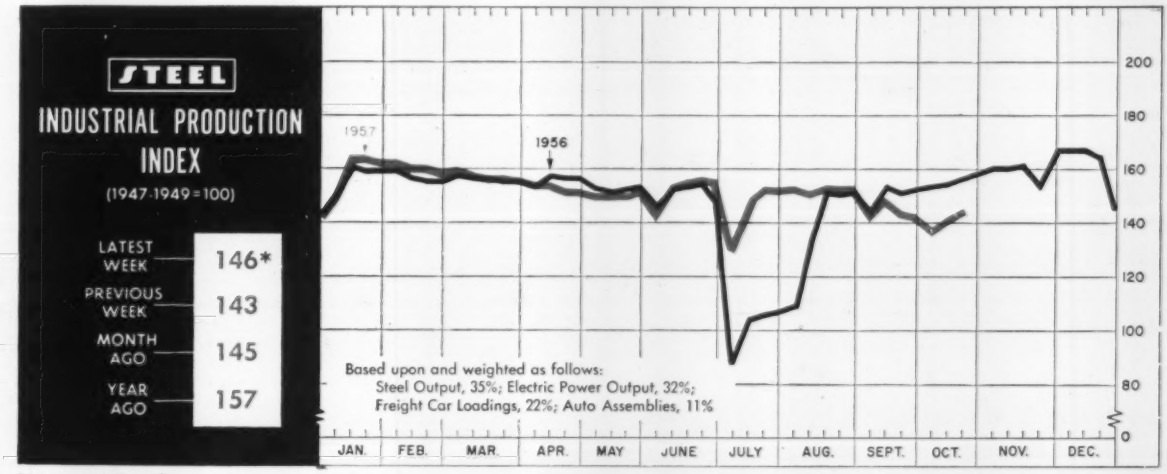


*Week ended Oct. 19.

Failures Rise as Business Community Grows

MORE BUSINESSES are headed for failure in 1957 than in any year since 1939, but don't let the bare fact throw you. For every firm that throws in the towel, ten new ones will enter the business arena.

Numbers Misleading—The rising mortality among all businesses has gained a lot of attention in the last year, but little effort has been made to put the figures in their proper place. The fact is that the rate of fatalities has not kept up with the growth of the business population. Since 1940, the business community has grown from 3,276,000 to something over 4.3 million. With such growth, it would seem logical to assume that failures would also be much higher. Yet this year's total will do little more than match the 13,619 figure for 1940 and will fall considerably short of the record 14,768 fatalities in 1939.

One of the big reasons for concern stems from comparisons. From 1943 through 1953 business was relatively secure. During the war, failures were almost unheard of. They began cropping up more often in 1947 and 1948, but the problem was not serious. Consumers were on a buying binge. Many persons with no particular business qualifications opened shops and found selling easy. But as the pent up desires became satisfied, marginal businesses started folding. The Korean War kept many from dropping out, but after that competition returned and weeded out more.

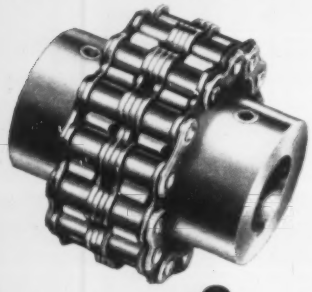
Basic Cause—With the gradual swing from the sellers' to the buyers' market, incompetence became a luxury few businessmen could afford. According to a Dun & Bradstreet study, this was the cause for 52.6 per cent of the manufacturing failures last year. Unbalanced experience and lack of competence all down the line resulted in inadequate sales, competitive weakness, receivable problems, and

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)[2]	2,045[1]	2,070	2,491
Electric Power Distributed (million kw-hr)	11,600[1]	11,709	11,333
Bituminous Coal Output (1000 tons)	9,915[1]	9,900	10,220
Petroleum Production (daily avg—1000 bbl)	6,750[1]	6,729	6,997
Construction Volume (*ENR*—millions)	$312.3	$323.9	$446.6
Auto, Truck Output, U. S., Canada (*Ward's*)	94,387[1]	59,847	117,930
TRADE			
Freight Car Loadings (1000 cars)	745[1]	742	829
Business Failures (Dun & Bradstreet)	244	261	259
Currency in Circulation (millions)[3]	$31,191	$31,129	$30,953
Dept. Store Sales (changes from year ago)[3]	−1%	0%	+5%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$21,835	$20,859	$20,761
Federal Gross Debt (billions)	$274.1	$274.1	$273.9
Bond Volume, NYSE (millions)	$24.1	$27.0	$15.2
Stocks Sales, NYSE (thousands of shares)	13,158	15,076	8,175
Loans and Investments (billions)[4]	$87.3	$87.9	$85.3
U. S. Govt. Obligations Held (billions)[4]	$25.3	$25.7	$25.7
PRICES			
STEEL's Finished Steel Price Index[5]	239.15	239.15	225.58
STEEL's Nonferrous Metal Price Index[6]	207.4	209.0	265.4
All Commodities[7]	117.6	117.6	115.2
Commodities Other Than Farm & Foods[7]	125.7	125.7	123.1

*Dates on request. [1]Preliminary. [2]Weekly capacities, net tons: 1957, 2,559,490; 1956, 2,461,893. [3]Federal Reserve Board. [4]Member banks, Federal Reserve System. [5]1935-1939=100. [6]1936-1939=100. [7]Bureau of Labor Statistics Index, 1947-1949=100.

ACME FLEXIBLE COUPLINGS



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Acme Flexible Couplings are used to connect two revolving shafts together and to compensate for angular and parallel misalignment. Acme precision, high capacity, flexible couplings are available in fractional to hundreds of horsepower ratings. They are simple to install and are available in both straight and convex rollers for varied applications.

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- Positive yet flexible
- Minimum backlash
- Economical
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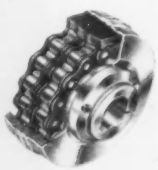

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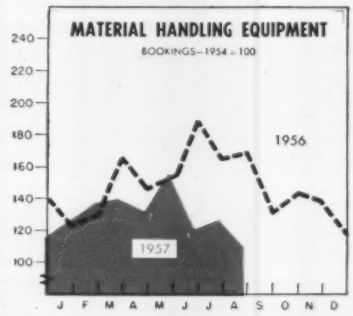
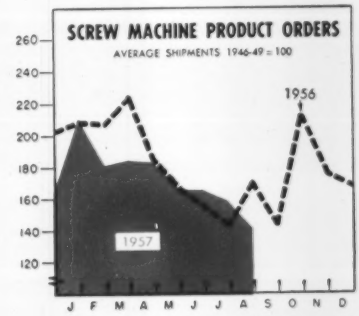


	1957	1956	1955	1954
Jan.	126.34	122.43	97.00	93.56
Feb.	139.29	129.56	98.71	96.45
Mar.	140.76	166.14	149.16	115.55
Apr.	132.67	145.20	109.52	122.76
May	157.95	155.53	110.50	98.54
June	121.57	189.13	139.00	112.42
July	128.31	165.50	111.76	91.68
Aug.	110.09	168.70	106.20	94.06
Sept.	....	130.35	136.80	88.43
Oct.	....	143.38	123.52	95.41
Nov.	....	138.50	118.09	88.66
Dec.	....	117.76	139.85	102.49
Avg	....	147.68	120.01	100.00

Material Handling Institute Inc.



	New Orders		Shipments	
	1957	1956	1957	1956
Jan.	211	208	206	216
Feb.	181	207	185	214
Mar.	185	224	197	215
Apr.	184	184	193	199
May	167	165	192	178
June	166	154	173	178
July	159	142	139	137
Aug.	143	170	177	172
Sept.	...	143	...	164
Oct.	...	213	...	202
Nov.	...	175	...	180
Dec.	...	167	...	167
Avg	...	179	...	186

National Screw Machine Products Assn.

Charts copyright, 1957, STEEL.

other difficulties too hot to handle.

Age No Insurance — Almost a fifth of last year's failures can be traced to the lush period following World War II. The percentage of failures accounted for by businesses ten years or older has been rising steadily since 1947, while the fatalities among those five years old or less has held steady at about 58 per cent of the total. Size is no safeguard. Last year, 49 firms with liabilities of more than $1 million closed down. This year the number should be about the same (there were 25 during the first half of 1957).

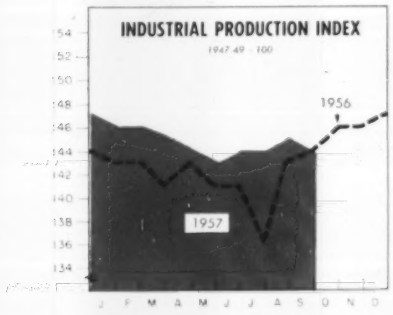
One of the hardest hit groups in the last two years has been the construction industry. According to Associated General Contractors of America Inc., Washington, the decline has been due in part "to increasing competition, the entrance of many new, inexperienced firms into the field, and the increasing hazards of doing business in today's economic atmosphere of rising costs and decreasing profits."

Growth Continues—The fact that incorporations outnumber failures ten to one assures the business community of a rise in population only slightly less spectacular than the 53,500 increase of last year. D&B reports that the September total of 10,526 was 9.8 per cent above the year-ago figure, bringing the nine-month total to 105,601. That's only 3091 under the corresponding level of 1956. It will be at least the third best year in history for new charters.

Index Continues Climb

STEEL's industrial production index continues its climb back up on the strength of rising auto production. (See chart, Page 137.) All carmakers are turning out 1958 models and shooting for full production before the middle of November. Before the quarter has run its course, weekly production could be the highest since the auto boom of 1955. Autodom has scheduled fourth quarter output to match that of last year's period, but schedules will have to be beefed up to meet the goal. Production got off to a later start than it did for '57s. If the difference is to be made up, it probably will be in the last six weeks of this year.

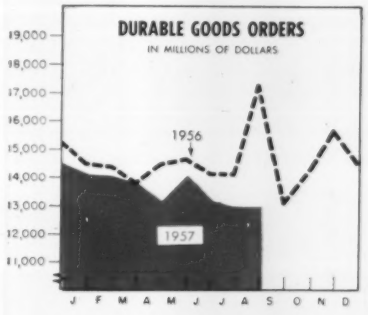
Output of electric energy staged a comeback during the week ended Oct. 12, gaining from 11.564 billion kw-hr the previous week to 11.709 billion kw-hr. It is too early



(Seasonally Adjusted)

	Total Production		Primary Metals		Metal Fabricating	
	1957	1956	1957	1956	1957	1956
Jan.	146	143	144	148	180	170
Feb.	146	143	143	146	180	168
Mar.	145	141	137	145	179	167
Apr.	144	143	136	146	176	170
May	143	141	132	141	175	167
June	144	141	132	136	177	168
July	144	136	133	69	177	169
Aug.	145	143	136	125	177	172
Sept.	144*	144	134*	148	174*	174
Oct.	...	146	...	147	...	177
Nov.	...	146	...	147	...	180
Dec.	...	147	...	145	...	183
Avg	...	143	...	137	...	172

Federal Reserve Board. *Preliminary.



	New Orders*		Sales*	
	1957	1956	1957	1956
Jan.	14,176	14,449	14,941	13,832
Feb.	14,102	14,374	14,808	13,824
Mar.	13,853	13,771	14,198	13,252
Apr.	13,234	14,468	14,254	13,723
May	14,115	14,654	14,296	13,570
June	13,249	14,093	14,207	13,587
July	13,005	14,087	14,573	13,021
Aug.	13,060†	17,342	14,184†	13,723
Sept.	.....	13,042	.....	13,449
Oct.	.....	14,312	.....	14,393
Nov.	.....	15,776	.....	14,249
Dec.	.....	14,543	.....	14,526

*Seasonally adjusted. †Preliminary.
U. S. Office of Business Economics.

to call it a trend, but the ultimate strength of this sector of the index should be clearly indicated within the next two weeks. Steel production remained near 81 per cent of capacity, and freight car loadings held at the 741,000 level.

Foundry Equipment Zooms

In August, the foundry equipment industry came up with one of the sharpest statistical reverses seen in metalworking in some time when it posted a mark of 231.3 (1947-49 = 100) on its new order index. It was the second best month since the current benchmark was adopted. In July, the index of the Foundry Equipment Manufacturers Association was at a 28-month low of 98.6. The record (235.5) was chalked up in August, 1953. The 1957 monthly average is up to 149.5, slightly ahead of the 1957 monthly average.

A source close the industry declares that the showing in August is not indicative of a trend. The index fluctuates wildly from month to month, and it simply means that some good business was awarded in August. "The industry watches the monthly average over a longer period, and this will help 1957's average to hold at the high level of previous years. But don't expect this to happen again soon," says the spokesman.

Trends Fore and Aft

- Dollar volume of construction activity will be more than $65 billion this year, according to Associated General Contractors of America Inc., representing a 3 per cent gain over 1956. Breakdown: New construction, $47 billion; maintenance and repair, $18 billion. Dollar volume will increase another 4 per cent next year.
- Bookings of material handling equipment hit the lowest point this year in August, totaling only 110.09 per cent of the 1954 average (see chart, Page 138).
- "Chances are that changes in the national output will be relatively small, whatever their direction," says the First National City Bank of New York. The change, as measured by the Federal Reserve Board, has been only about 2 per cent so far this year (see table above).
- Durable goods new orders in August were the lowest since September, 1956. Shipments were the lowest this year (see table above).

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Hidden costs are prevalent in four areas: (1) lack of adequate police and fire protection, the latter resulting in high insurance premiums; (2) lack of adequate water supply and sewage disposal systems, substantially increasing maintenance costs; (3) non-proximity to consumer and raw materials markets and inadequate transportation facilities, creating costly shipping and receiving problems, and (4) lack of qualified personnel, causing additional recruiting and training expenses.

The most deceptive superficial advantages are low land acquisition costs and substantial tax concessions. Both "advantages" disappear when population increases necessitate new schools and other municipal services . . . both may penalize and alienate established industry in the area . . . both rarely offset high maintenance costs.

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Olin Aluminum marketing

RICHARD C. DIEHL
Universal-Cyclops v. p.

MATTHEW J. BETLEY
Titeflex Inc. president

ARCH C. SHAFER
Benchmaster gen. sales mgr.

Elmer M. Richardson joined **Olin Mathieson Chemical Corp.**, New York, as director of marketing for Olin Aluminum. He was general sales manager, refractories division, H. K. Porter Company Inc.

Richard C. Diehl was elected vice president - operations, **Universal-Cyclops Steel Corp.**, Bridgeville, Pa. He was formerly president of Chase Brass & Copper Co., and served in various management and metallurgical capacities with Wheeling Steel Corp. and Armco Steel Corp.

H. L. Burton Jr. joined **Baron Steel Co.**, Toledo, Ohio, as assistant to the president.

Sherman Products Inc., Royal Oak, Mich., appointed **Warren E. Henderson** sales operations manager; **William W. Wigle**, sales manager, field operations.

Nelson M. Camp joined the purchasing department of **Kennecott Copper Corp.** in New York. He was in charge of purchasing for the Chase Metal Works, a division of Chase Brass & Copper Co.

James A. Johnson was made executive assistant to the vice president-general manager, **Western Brass Mills**, division of Olin Mathieson Chemical Corp., East Alton, Ill.

Richard G. Hurlburt was made sales manager of **Oliver Corp.'s** industrial division, which will transfer from Chicago to Cleveland, effective Nov. 1.

Matthew J. Betley was named president of **Titeflex Inc.**, Springfield, Mass., subsidiary of Atlas Corp. Most recently he was a consultant to Gar Wood Industries.

W. W. Eberhart was elected vice president-sales and distribution for **Autoquip Corp.'s** oil hydraulic lifting devices division. He was central division manager, Rotary Lift Co.

The newly merged **Pfaudler Permutit Inc.**, New York, elected officers: **Henry W. Foulds**, chairman; **Ranlet Miner**, vice chairman; **Mercer Brugler**, president; **D. A. Gaudion**, executive vice president; **E. Geisinger**, senior vice president.

W. M. Watkins Jr. was named sales manager of the new seal sales division of **Robertshaw-Fulton Controls Co.**, at Knoxville, Tenn. He is assisted by **George H. Giesler** as applications engineer.

F. C. Berliner was elected vice president, **Maysteel Products Inc.**, Mayville, Wis. He continues as sales manager and as assistant to the president.

Dennis L. Gallogly was made assistant executive engineer, **Cooper-Bessemer Corp.**, Mt. Vernon, Ohio. Formerly chief engineer, product division, he is succeeded by **R. F. Kymer.**

Joseph O. Thill was made Pittsburgh district manager, **H. M. Harper Co.**, Morton Grove, Ill.

Arch C. Shafer was made general sales manager, **Benchmaster Mfg. Co.**, Gardena, Calif. He was sales manager for Cold Metal Products Co.'s Metallon Div.

A. D. Brown, vice president in charge of **Detroit Steel Corp.'s** eastern strip mill at Hamden, Conn., transfers to Detroit to succeed **Joseph P. Pulte**, vice president-general manager, Detroit strip mill, who retires Nov. 1. Mr. Brown will supervise both the Detroit and eastern strip mills. At the Detroit mill, **Richard A. Schrage** was made general superintendent; **Frederick L. Otto**, assistant general superintendent. At the eastern mill, **Tom R. Adams** was made general manager; **Edward J. Hofer**, manager of sales, New Haven, Conn., district sales office.

Lester C. Hill was made assistant sales manager of **Crucible Steel Co. of America's** Pittsburgh Crucible Sales Div., Pittsburgh. Mr. Hill was sales manager, Vulcan Crucible Steel Div., H. K. Porter Company Inc.

Carl O. Windrath was made works manager, Rome, N. Y., division, **Revere Copper & Brass Inc.** He succeeds **James A. Phillips**, now an assistant general manufacturing manager at Revere's executive offices in New York. Other appointments at the Rome division: **Fred L. Meiss Jr.**, assistant works manager; **James M. Kennedy Jr.**, chief engineer.

Arnold J. Martin was appointed

LOWELL JENSEN BERNARD MATTER RONALD ASHENFELTER

promotions at Famco Machine Co.

vice president, **Samuel Greenfield Co. Inc.**, Buffalo.

Famco Machine Co., Kenosha, Wis., appointed **Lowell Jensen** works manager; **Bernard Matter**, chief engineer; **Ronald Ashenfelter**, chief purchasing agent. **John E. Glebs** was made vice president-controller.

J. H. Schliesleder was elected president of **Bearings Inc.**, Milwaukee, to succeed the late **William Farrell. J. H. Connell** succeeds Mr. Schliesleder as treasurer and sales manager.

Herbert H. Bloom, one-time president of Massey-Harris-Ferguson Inc., joined **J. I. Case Co.**, Milwaukee, to become president of its recently organized subsidiary, J. I. Case International.

Thomas M. Nourse was named head of central station sales for **Hagan Chemicals & Controls Inc.**, Pittsburgh. He is replaced as Pittsburgh district manager by **Louis C. Bishop.**

Fred B. Hout, vice president-sales, was named president of **Barnes Mfg. Co.**, Mansfield, Ohio, to succeed **M. H. Pryor**, who becomes chairman.

Arch Wallen was made factory manager, Northrop Div., **Northrop Aircraft Inc.**, Hawthorne, Calif.

Peter J. Hackett was made executive vice president and general manager of **Riordan Engineering Co.**, Los Angeles.

John W. McGovern was elected president and chief operating officer of **United States Rubber Co.**, New York. Formerly executive vice president, he succeeds **H. E. Humphreys Jr.**, who continues as chairman and chief executive officer.

J. Warren Ogletree was made chief engineer-manufacturing; **Thomas J. Gibbs**, assistant chief engineer at U. S. Steel Corp.'s **Tennessee Coal & Iron Div.**, Birmingham.

David H. Kinder was named research and development chemist by **MacDermid Inc.**, Waterbury, Conn.

John H. Caldwell was promoted to assistant sales manager, protective coatings division, **Pittsburgh Coke & Chemical Co.**, Pittsburgh. He was regional sales manager in Houston.

Fred W. Bush was elected president, **Vinson Steel & Aluminum Co.**, Houston. Formerly executive vice president, he succeeds **Granville B. Lane**, who retires Dec. 31. **Ralph A. Castillo** was made manager of the Houston warehouse.

Dr. Peter Fortescue joined **General Atomic Div.**, General Dynamics Corp., San Diego, Calif., as chief research and development engineer.

Blaw-Knox Co. appointed **Robert E. Walsh** regional vice president in the Chicago area. He continues supervision of roll sales in the area, and maintains his present office at the East Chicago, Ind., Works.

Edward Hoffart was made chief engineer, **Topp Mfg. Co.**, Los Angeles, division of Topp Industries Inc. He replaces **R. L. Baddorf**, named technical assistant to the president.

Richard B. Gewetzki was made director of procurement at **Wells Aluminum Corp.**, North Liberty, Ind.

R. J. Grubba, chief engineer, was appointed vice president-engineering, **Wettlaufer Engineering Corp.**, Detroit. **Oren Downs** was promoted to superintendent of metal fabrication to replace **O. C. Davidson.**

George M. Kovac was made director of the engineering department of **Ren Plastics Inc.**, Lansing, Mich. He was with Cog Corp.

William F. Gearhart was appointed die sales co-ordinator for **Kennametal Inc.**, Latrobe, Pa. **Roger M. McCray** succeeds **George J. Raible**, retired, as Cincinnati district manager.

Louis W. Hamper Jr. fills the new post of assistant to the vice president in charge of Gibson sales for **Gibson Refrigerator Co.**, division of Hupp Corp., Greenville, Mich.

Ralph L. Hitz was appointed sales and service engineer for **Tri-Belt Div.**, Sparton Corp., Jackson, Mich. He was sales manager, Gilbert Mfg. Co.

John C. Jett was made eastern division sales representative in Pittsburgh for **National Supply Co.** He succeeds **William Van Vleet**, retired.

Frank J. Bias was made manager of transmitter engineering for **General Electric Co.'s** technical products department, Syracuse, N. Y. **Harold G. Towlson** was made manager of engineering for the department.

Warner Electric Brake & Clutch Co., Beloit, Wis., appointed **John A. Kriva** manager of manufacturing engineering for its industrial division.

Edward H. Baxa was appointed manager of the processing machinery department of **Allis-Chalmers Mfg. Co.**, Milwaukee. He succeeds **R. L. Halsted**, recently named gen-

Let's Talk About Alloys

NIAGARA FALLS, N. Y.

CHARLESTON, S. C.

CALVERT CITY, KY.

Pittsburgh Met works hand in hand with the steel industry to improve its present products and to develop new methods and alloys which are better suited to the industry's needs. Experimental units are continually in operation in furthering this research.

We fully recognize that the cost of alloys bears a direct relationship to the cost of producing steel. For that reason, we employ and utilize both in research and production the services of personnel who have received their training in the steel industry and who fully understand alloy application and utilization. By so doing we have been unusually successful in bringing about appreciable cost savings by steel manufacturers and have been equally successful in developing and perfecting new alloys to do the job better.

The development and introduction to the steel industry of medium carbon ferrochrome as a substitute for the more expensive low carbon ferrochrome is a definite example of this program of cooperation. Other product refinements growing out of our alloy "know how" have similarly contributed to the steelmaker's art.

Your problems are our problems and we continue to offer our full cooperation and resources in assisting the steel industry to reduce costs while improving quality.

We are a major producer of:

High Carbon Ferrochrome
High Carbon Ferrochrome — Low Sulphur
Medium Carbon Ferrochrome
Low Carbon Ferrochrome Silicon
Ferrosilicon — All Grades
High Silicon Alloy Pig Iron
High Silicon Pig Iron — 14% to 17% Grades
Silico Manganese
Standard Ferromanganese
Special Ferro Alloys

Our plants are strategically located at Niagara Falls, N. Y., Charleston, S. C. and Calvert City, Ky., to serve you promptly via railroad, water transportation and motor freight.

Pittsburgh Metallurgical Company, Inc.

GENERAL OFFICES.....NIAGARA FALLS, NEW YORK

District Offices

CHICAGO CLEVELAND DETROIT PITTSBURGH PHILADELPHIA

DONALD A. MacRITCHIE
Artisan Metal v. p.

DAVID M. GASKILL
joins Airborne Instruments

JOHN A. WENTWORTH
Associated Spring div. mgr.

eral manager, industrial equipment division.

Donald A. MacRitchie was elected vice president and general manager, **Artisan Metal Works Co.**, Cleveland. He was vice president-sales and engineering. He succeeds **Jack G. Allen**, former president and general manager, who resigned to join a family business, Allen & Son Iron Works, in California. **Arthur C. Lundgren**, chairman, also will be president.

David M. Gaskill was appointed manager of industrial product sales for **Airborne Instruments Laboratory**, Mineola, N. Y. He was manager of industrial equipment for Brush Electronics Co.

Paul R. Barrett joined **Lockhart Iron & Steel Co.**, McKees Rocks, Pa. He will supervise sales of carbon and alloy steel billets; also sales of warehouse stocks of carbon steel. Mr. Barrett was with C. A. Waite Co.

United Engineering & Foundry Co., Pittsburgh, appointed **William H. Betts** staff metallurgist. He was sales and service engineer in the roll division.

Raphael J. Larko was made product manager of ventilators for **American Steel Band Co.**, Pittsburgh. He was formerly with Burt Mfg. Co.

Clifford A. Winans was promoted to superintendent of diecast operations at **Brown-Lipe-Chapin Div.**, General Motors Corp., Syracuse, N. Y.

Elmer E. Babos was made sales manager, **Ohio Structural Steel Co.**, Newton Falls, Ohio.

John A. Wentworth was made general manager, **Associated Spring Corp.'s** Ohio division, Dayton, Ohio. He succeeds **Harry B. Dauphinais**, recently made general manager of the corporation's William D. Gibson Co. division. Mr. Wentworth was assistant manager, Spring Works, Wallace Barnes Div.

Chester S. Johns was made sales manager, **Buhr Machine Tool Co.**, Ann Arbor, Mich. He was with Cross Co.

Walter E. Thill was made chief engineer of the new service engineering department of **Federal-Mogul-Bower Bearings Inc.**, Detroit.

Charles M. Albritton was named vice president - manufacturing, **Huck Mfg. Co.**, Detroit. He was plant manager.

William W. Kearney was made manager, production control, **Baker-Raulang Co.**, Cleveland, subsidiary of Otis Elevator Co. He was manager of planning and materials at the electronics division of Otis.

Paterson-Leitch Co., Cleveland, appointed **Arthur F. Besch** sales manager; **Carl A. Beutel**, assistant sales manager. Mr. Besch formerly served as purchasing agent and manager of the warehouse department.

Joseph E. Praser was made general superintendent, Cleveland steel service plant, **Joseph T. Ryerson & Son Inc.** He replaces **James J. Connaughton**, now assistant to the general manager.

Frank W. Jenks was elected president, **International Harvester Co.**, Chicago, succeeding **Peter V. Moulder**, retired. Mr. Jenks was executive vice president.

Robert B. Ganley joined **Syracuse Heat Treating Corp.**, Syracuse, N. Y., as vice president and general manager. He was with Sanderson-Halcomb Div., Crucible Steel Co. of America.

Joseph S. McVey Jr. was made casting design engineer for **Everett-Lynn Foundries**, General Electric Co., Schenectady, N. Y.

James E. Kennerly joined the labotory staff of **Lea Mfg. Co.**, Waterbury, Conn. He was finishing superintendent, Bassick-Sack Div., Stewart-Warner Corp.

Kelly G. Smith was made quality control manager; **George Gasper**, chief tool engineer at **Chance Vought Aircraft Inc.**, Dallas.

OBITUARIES...

Gilbert Butler, 70, former president and general manager, **Bossert Co.**, Utica, N. Y., died Oct. 13.

E. B. Greene, 79, former chairman, **Cleveland-Cliffs Iron Co.**, Cleveland, died Oct. 20.

Arnold J. Malcolm, 62, president and chairman, **Erin Industries Inc.**, San Diego, Calif., died Oct. 12.

Albert H. Clarke, 54, vice president-manufacturing, **Crouse-Hinds Co.**, Syracuse, N. Y., died Oct. 9

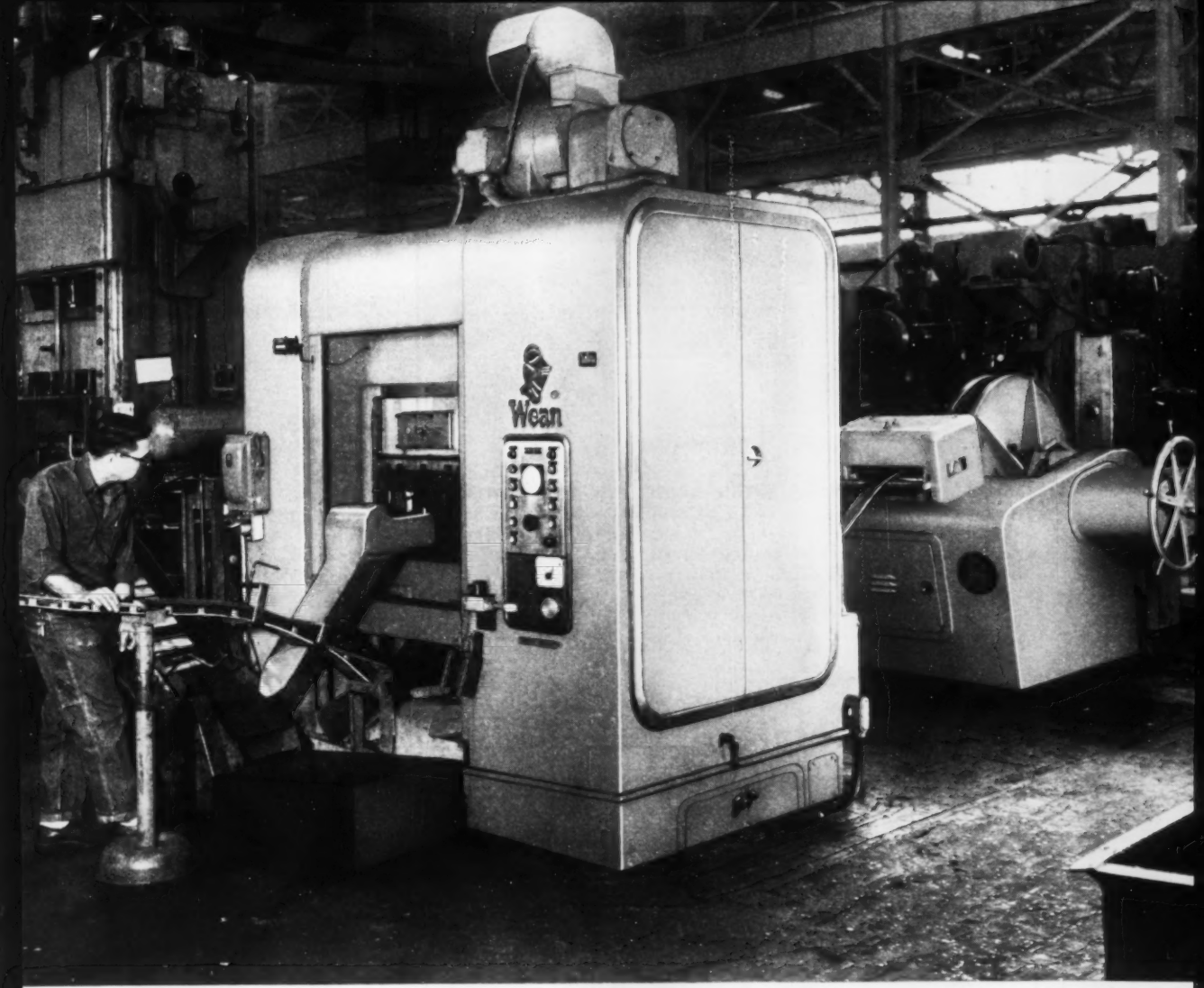
Harold W. Melampy, 50, general manager, **Roto Mfg. Co.**, Xenia, Ohio, died Oct. 8.

John Follansbee, 89, retired chairman, **Follansbee Steel Corp.**, Pittsburgh, died Oct. 9.

William F. Syring, secretary-treasurer, **Apex Bolt Products Co.**, Chicago, died Oct. 8.

Gilbert Butler, 70, former president, **Bossert Corp.**, Utica, N. Y., died Oct. 13.

Robert G. Shinabarger, 63, general sales manager, **New Holland Machine Co.**, New Holland, Pa., division of **Sperry Rand Corp.**, died Oct. 15.



One Wean "Flying Press"

replaces two conventional presses

THE 100 x 24 x 36 WEAN FLYING-PRESS above, is turning out transmission vanes in the plant of a major automobile manufacturer. The vanes, 3¾" long by 1⅝" wide, are blanked out of .042" steel strip and formed through a seven stage die. Previously produced by two conventional presses, each operating at 154 S.P.M. their combined production will be more than equaled by this single Wean Flying-Press operating at 350 S.P.M. Typical of the specialized engineering which Wean applies in "tailoring" press and auxiliary units to a specific operation is the ingenious mechanism which receives the vanes from the press and nest-stacks them for maximum ease of handling.

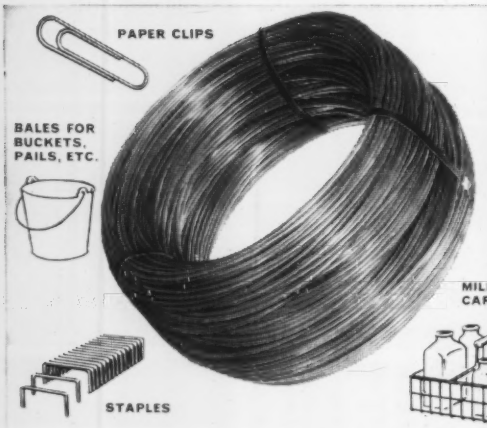
But here is the important fact to cost conscious manufacturers . . . this Wean Flying-Press will materially reduce production costs: since only half the number of press units are now required for this operation, operating and maintenance costs are cut by more than 50%—supervision and handling requirements are proportionately reduced—and, less production space is required.

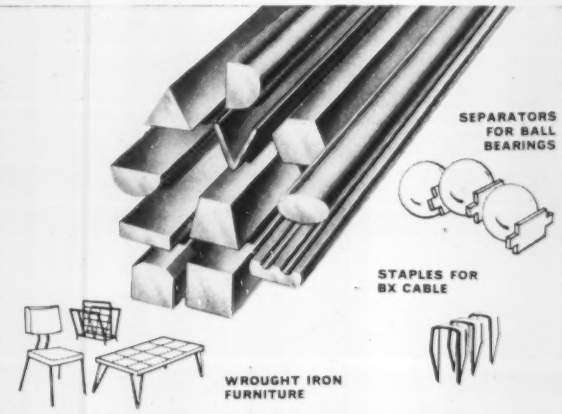
In addition to increased production rates, the Flying-Press incorporates many other cost saving advantages, too. But get the complete story by writing today for your copy of the Wean Flying-Press brochure.

475

Wean Equipment Corporation

CLEVELAND 17, OHIO





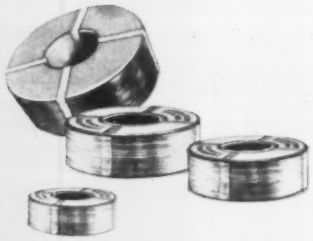
ROUND WIRE—Sizes and finishes to meet almost any specification—$\frac{9}{16}$" on down, in coppered, tinned, bright, galvanized, and other finishes. Made with exactness and uniformity to insure excellent forming and workability. Mill catchweight coils up to 600# or single length Econo-Coils up to 3000# can be supplied, depending on quality, finish and gauge.

STANDARD AND SPECIAL SHAPES—Cut costs where it counts most—on forging, stamping, rolling and machining for moldings, product trim or other fabrication. Many shapes and sizes are available—V-shaped, oval, square, rectangular, keystone-shaped, and others. It will pay you to check their many cost-saving possibilities.

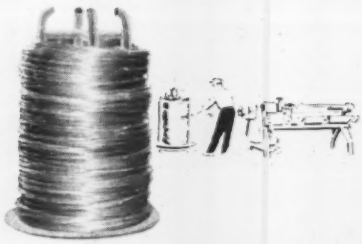
You can do it BETTER at LESS COST with...

CONTINENTAL® WIRE

In practically any size, finish, temper or analysis in low and medium low carbon steels



FINE AND SPECIALTY WIRE
Staple wire, tag wire, shoe wire, florists wire, pin wire, coil binding wire—an almost endless list of fine wire for special application. Many finishes, tempers and sizes.



ECONO-COIL Continuous length wire coils of 2000# to 3000# catchweight, in sizes from 12 gauge through $\frac{1}{2}$" diameter. Reduces scrap loss up to 90 percent. Shipped on returnable Econo-Coil reels.

LEVERPAK—FOR FASTER, CLEANER WIRE HANDLING

Saves scrap, reduces down time. Protects wire from moisture, dirt, and the damage of ordinary handling. Permits long, uninterrupted runs of 500# to 650#. Easy to ship and store.

Send today for Data on Wire
Profit by our thousands of case histories that may point the way to significant savings for you... with Continental Wire.

Wire Specialists for over Half a Century

CONTINENTAL

STEEL CORPORATION • KOKOMO, INDIANA

PRODUCERS OF: Manufacturer's Wire in many sizes, tempers, and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright and special shaped wire. Also Welded Wire Reinforcing Fabric, Nails, Continental Chain Link Fence, and other products.

U. S. Industries Inc. Reorganizes

Manufacturing and marketing functions are consolidated in three major divisions in move to establish better earning position. Heavier competition, low profit margins cited

U. S. INDUSTRIES Inc., New York, a diversified organization with most of its operations in the metalworking field, has reorganized and consolidated manufacturing and marketing functions in three major divisions along "product group" lines.

"The reorganization was prompted," says John I. Snyder Jr., president and chairman, "by long range studies which proved to us that it is possible to establish a substantially better profit position in spite of today's heavy competition and the low profit margins that prevail generally. All the projected changes are in the interest of better operating and marketing efficiency, designed to increase both sales, and, more important, earnings."

Divisions—Divisions affected are: Axelson Mfg. Co., Los Angeles (engine lathes, petroleum production equipment, and aircraft components); Clearing Machine Corp., Chicago (metalworking presses); and Western Design & Mfg. Corp., Santa Barbara, Calif. (electronic systems and components for aircraft and guided missiles).

Axelson's engine lathe production operation is being moved to the Clearing Machine Div., which has plants in Chicago and Hamilton, Ohio. The lathes will be manufactured by Clearing, but they will continue to be sold by Clearing under the Axelson name.

Aircraft Operations—Axelson's aircraft production, principally involving landing gear, struts, and hydraulic equipment, has been consolidated with Western Design for administrative purposes. Axelson's new aircraft facility at Montebello, Calif., will branch out into the manufacture of electronic and electromechanical devices developed by Western Design. The combined operation will be under the direct supervision of C. W. Sponsel, president of Western Design.

Machine Tools—"Along product group lines," Mr. Snyder points out, "Clearing Machine becomes our central producer of heavy duty machine tools—presses and lathes. We are creating a central facility for the production of aircraft components and electronic and electromechanical devices in Montebello. Axelson, already a major producer of oil field equipment . . . will expand even more in this field by concentrating all its efforts along these lines on a wider product basis."

He adds that the big potential market for engine lathes lies more within Clearing's geographical area in the Midwest than it does on the West Coast. Axelson has not been earning profits with its lathe operation, he points out. "The basic difficulty is the limited market on the West Coast. It became clear that since the largest market for lathes is in the Midwest, and since many lathe manufactures are situated there, Axelson was running its lathe operation at a competitive disadvantage on the basis of freight rates alone. We are sure," Mr. Snyder asserts, "that this will be corrected when we move lathe manufacture to the Clearing Div."

Oliver To Move Division

Industrial Div. headquarters of Oliver Corp., Chicago, will be transferred to Cleveland, effective Nov. 1. The corporation makes farm and industrial equipment. The division offices will be in Oliver's Cleveland plant, which produces crawler tractors and attachments. R. G. Hurlburt has been appointed sales manager of the Industrial Div.

SPS Offers Novel Service

Standard Pressed Steel Co., Jenkintown, Pa., is establishing a coast-to-coast network of screw-thread measuring laboratories to help industry with fastener fit and gaging problems. Three identical screw-thread metrology laboratories will be opened early in 1958 at company plants at Jenkintown, Cleveland, and Los Angeles.

Primary goals will be to help industry meet increasing demands for mechanical precision in nuclear and missile applications and to reduce production losses resulting from fastener assembly problems.

U. S. Steel Shifts Division

United States Steel Corp., Pittsburgh, will operate its Gerrard Steel Strapping Div. as part of United States Steel Supply Div., Chicago. Clifford F. Hood, president, said that this move, in the direction of simplification of organizational structure, is designed to provide improved service to Gerrard customers. Gerrard Steel Strapping supplies flat and round steel strapping service to all types of industries.

Atlanta Firm Renamed

Southern States Iron Roofing Co., Atlanta, a subsidiary of Reynolds Metals Co., Louisville, changed its name to Reynolds Aluminum Supply Co. The firm operates manufacturing plants in Atlanta and Birmingham and maintains nine distribution centers.

Moves Missile Operations

Electronics Engineering Co., Santa Ana, Calif., closed its Florida Div. offices and transferred its research and development operations at Cape Canaveral (Fla.) Missile Test Center to the company's main laboratory in Santa Ana. The firm has designed and developed missile range instrumentation equipment for the Air Force base at a cost of more than $4 million.

Installs Extrusion Press

Great Lakes Carbon Corp.'s Electrode Div., New York, has placed in operation an extrusion press designed for production of graphite anodes and other small cross-sectional pieces. The press is part of a new graphite producing system (including weighing and mixing facilities) which has a revolutionary cooling runway, says R. B. Wittenberg, vice president of

(*Please turn to Page* 150)

DU PONT *PRODUCT NEWS*

REG. U.S. PAT. OFF.

New Du Pont cost-analysis method helps you save money two ways

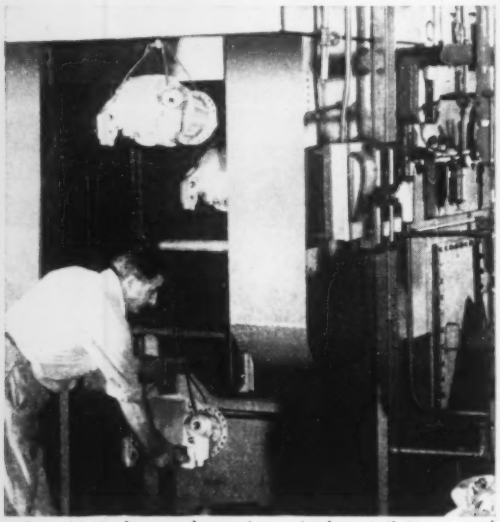
• Du Pont's exclusive cost-analysis method can help you cut cleaning costs or help you choose the best cleaning process for your needs. This new service is now available at no cost or obligation. Check coupon for more details.

Du Pont and its distributors of "Triclene" D® trichlorethylene now offer an accurate method for analyzing all costs involved in metal cleaning. This new Du Pont service can save you money by helping you (1) determine where present cleaning costs can be cut, or (2) choose the most efficient cleaning process if you're expanding or planning a new installation.

Du Pont's exclusive cost-analysis method combines 25 years of metal-cleaning experience with proven cost-accounting procedures. The result is a simplified and thoroughly reliable way to compare all costs of various cleaning processes or of alternate methods of handling your present cleaning operation.

Du Pont's cost analysis gives you a *complete* cost picture and doesn't stop with the obvious, and usually misleading, cost factors such as equipment, solvent or chemicals. You'll be able to answer any question about your cleaning costs confidently and instantly spot those that are out of line.

Du Pont, or its distributors of "Triclene" D, will be glad to give you full details. Whether it's cutting costs, improving your present cleaning results or trying to decide which cleaning process is best for you—you can get accurate answers using Du Pont's proven cost-analysis method. Use the coupon for prompt attention.



• Conveyorized vapor-degreasing unit cleans oil, grease and chips from machined aircraft cylinders.

Why vapor degreasing with "TRICLENE" D® is ideal for assembly-line cleaning

It's fast – Vapor degreasing with "Triclene" D removes grease, oil, cutting compounds and other contaminants– usually in less than a minute!

It's thorough —Vapor degreasing with "Triclene" D leaves parts clean and dry– instantly ready for the next operation; never causes etching or staining– leaves no deposits of any kind.

It's versatile – Vapor degreasing with "Triclene" D will clean parts made of all common metals and alloys, in any size or shape.

It's economical – Vapor-degreasing equipment is compact and inexpensive to install. Parts come out dry, eliminating need for dryers – saves valuable floor space. You'll find that the superior cleaning action of "Triclene" D eliminates rejects, cuts downtime.

It's easy to operate – Anyone can do it. In fact, vapor degreasers can be run automatically. Du Pont will be glad to provide instructions for proper operation of your vapor degreasers if you wish.

▶ If you would like to know more about degreasing, or want to be sure you're getting the most efficient cleaning from your present degreaser, call your Du Pont "Triclene" D distributor. If needed, he can call in one of Du Pont's metal-cleaning experts. You can also contact any Du Pont district sales office or use the coupon at right.

FOR MODERN METAL CLEANING

Du Pont's combination of neutral stabilizers makes "TRICLENE" D® THE BEST BUY IN DEGREASING SOLVENTS

It's a proven fact that "Triclene" D trichlorethylene gives brighter, stain-free cleaning; keeps degreaser coils free of sludge, thus reducing costly downtime and maintenance problems from clean-outs. All of these advantages can be traced to the unique combination of *neutral* stabilizers present in today's "Triclene" D.

Developed by Du Pont research, these stabilizers guard against attack from any deteriorating influences that may be involved in cleaning today's common metals and alloys. As a result, acids—formed by metals such as aluminum, or by contaminants such as oil, grease and cutting compounds—have no harmful effect on "Triclene" D's cleaning action. You get more mileage from "Triclene" D . . . or, put another way, you need less solvent to do the cleaning job when it's "Triclene" D.

Here's another economy feature. The neutral stabilizers in "Triclene" D are locked in and can't escape during distillation. Result: "Triclene" D is just as good after distillation as it was when Du Pont shipped it to you.

Experience in hundreds of metalworking plants has proved that "Triclene" D is the best buy in degreasing solvents. If you would like to prove it in *your* degreasing operation, just call Du Pont, any distributor of "Triclene" D, or use the coupon below.

Your distributor of "TRICLENE" D®— *a good man to have on your team*

Take inventories, for example. Think how much more of a problem they would be if you couldn't just call your distributor and get whatever supplies you need, where and when you need them. This applies not only to "Triclene" D, but to all of the other products he stocks locally for your convenience. But just one call from you—sometimes at the last minute—and you get the materials you need to keep production lines rolling. This convenience extends to your bookkeeping, where a single invoice can cover all of the different products you order.

More important perhaps than any of these valuable services is your distributor's local interest in you and your company. As an active member in your community, he takes care to provide you with quality products and any technical service that may be needed. If a difficult metal-cleaning problem develops, for example, he can call to your aid one of Du Pont's technical men. And it doesn't have to be a problem—he'll be glad to bring in an expert just to talk over any new ideas or plans you may have for expansion. Such meetings can often save you time and money.

Your distributor of "Triclene" D is a storehouse of valuable information, too. Manufacturers of the many products he represents keep him posted on new developments. He is always glad to share his information and provide you with useful literature. Think about the number of ways your distributor of "Triclene" D can help you—then give him a call. You'll find he's a good man to have on your team.

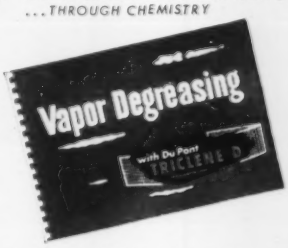
* * *

DID YOU KNOW 7 degreasers using "Triclene" D went two years without the need for a clean-out for a leading aircraft company? Striking proof of the stability, purity and dependability of this rugged solvent.

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

FREE VAPOR-DEGREASING BOOKLET tells you how vapor degreasing works, shows types of equipment, points out many cost-saving advantages. Just mail the coupon below for your copy.



ELECTROCHEMICALS DEPARTMENT
Chlorine Products Division

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Wilmington 98, Delaware

☐ Please send more information on your new cost-analysis method. S-1028
☐ Please send me your booklet on vapor degreasing.
☐ Please have your representative call for an appointment.

*Name*_____ *Position*_____
*Present method of cleaning*_____
*Firm*_____
*Address*_____
*City*_____ *Zone*_____ *State*_____

BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT

Obsolescence, unlike depreciation, is *not* a loss factor that can be estimated and provided for out of income. Yet, the operation of obsolete equipment *does* cost money . . . a cost that represents, more often than not, a loss far in excess of depreciation.

When you are buying new heat treat equipment, it is only good practice to buy with an eye to the future. By looking into such problems as atmospheres, automation, safety, mechanics, hydraulics and so on . . . today . . . you materially reduce tomorrow's obsolescence factor. Sometimes, existing furnaces can be redesigned with modern techniques and, as a result, can be geared to present production demands.

In any case, it is a good idea to talk over your problem with a Holcroft engineer. He has the technical know-how, the training and practical experience, to help you reduce early obsolescence in your plant. You'll find that Holcroft furnaces are built to answer today's problems—*and tomorrow's too.* Write for information.

6263

HOLCROFT AND COMPANY

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PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • HARTFORD, CONN. • HOUSTON, TEXAS • PHILA., PA.

CANADA: Walker Metal Products, Ltd., Windsor, Ontario

(*Concluded from Page* 147)

the corporation and general manager of the division.

Republic Sells Chain Unit

Republic Steel Corp., Cleveland, sold the machinery, tools, inventories, and equipment of its Chain Div. to Campbell Chain Co., York, Pa., and has discontinued production of chain. Republic retains all other assets of the division, principally the land and buildings of the Cleveland plant at 4801 Chaincraft Rd.

Tata Steel Expanding

Kaiser Overseas Engineering Corp., Oakland, Calif., will complete its $135-million expansion of Tata Steel Works, Jamshedpur, India, well ahead of schedule early next spring.

NEW PLANTS

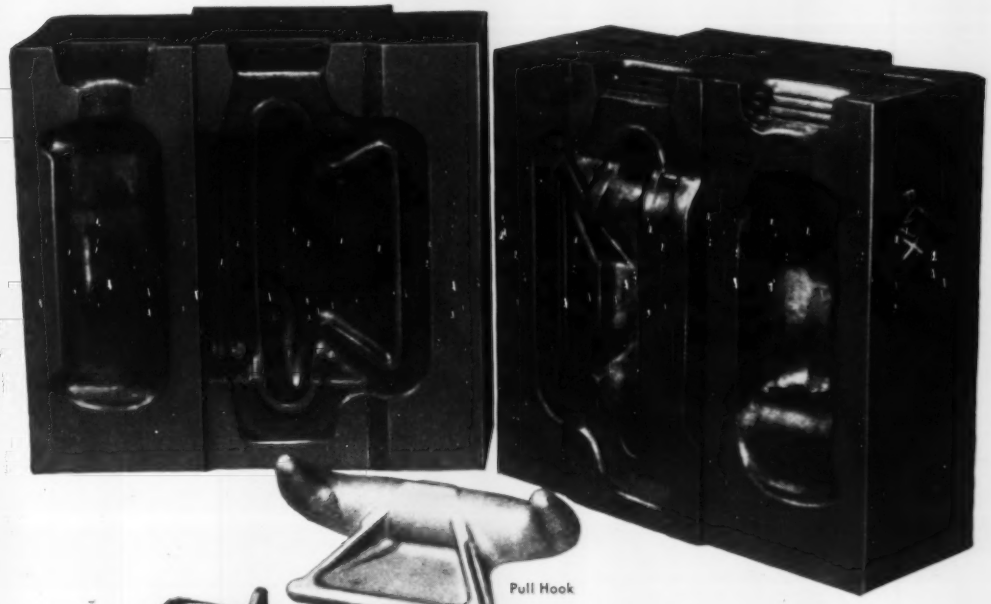
Power was turned on for the first time Oct. 9 in the $12-million plant of **Hooker Chemicals Ltd.**, Vancouver, B. C. The plant has a rated daily capacity to produce 110 tons of 50 per cent and 73 per cent caustic soda, 100 tons of chlorine, and 1 million cu ft of hydrogen. A $3.5-million research center is being built on Grand Island, B. C., to serve the eight plants of Hooker Electrochemical Co., Niagara Falls, N. Y., parent organization.

Rich Steel Co., distributor of carbon steel sheets, strip, bars, and tin mill products, is constructing a 33,000 sq-ft warehouse at 5930 Bandini Blvd., Los Angeles.

Uranium Reduction Co., Moab, Utah, dedicated its $9-million mill which is managed by **American Zinc, Lead & Smelting Co.**, St. Louis.

Pheoll Mfg. Co., Chicago, producer of metal fasteners, acquired a 76,000 sq-ft plant at Michigan City, Ind. Noland McDonald is general manager of the new plant.

Sta-Rite Products Inc., Delavan, Wis., plans to build a plant there in



Pull Hook

Pivot Shaft and Bracket

Equalizer Spring Saddle

USE FINKL DIE BLOCKS FOR QUALITY FORGINGS...

farm equipment manufacturers do!

Track Link

Draw Bar Bracket

International Harvester Company's Tractor Works, for one, uses Finkl die blocks to produce numerous tractor parts such as the pivot shaft bracket, pull hook, track link, equalizer spring saddle, and draw bar bracket shown on this page.

Because of the high volume production of these Crawler Tractor parts, Finkl FX die blocks are used at Harvester's Tractor Works to produce more forgings per sinking, and more sinkings per die. The special machining quality reduces die sinking time, without impairing the heat or wear resistance of the dies in production.

Finkl die blocks are available in several grades, all sizes, and tempers to handle virtually any forging requirement. Call your local Finkl representative next time you are considering die blocks or forgings. He will be glad to help you and there is no obligation.

DIE BLOCKS · FORGINGS · HOT WORK STEELS · ELECTRIC FURNACE STEELS

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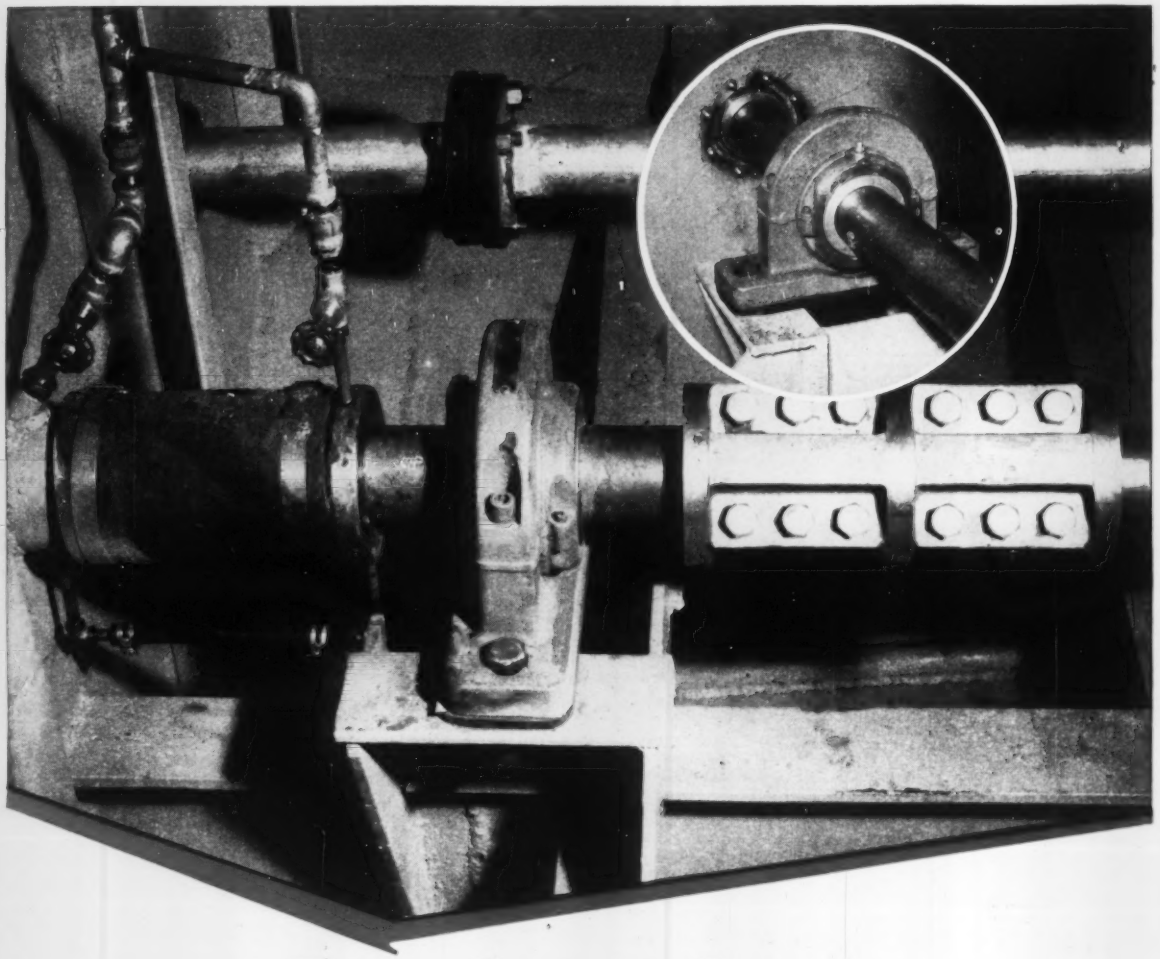

Bearings, Inc.

helps engineers design more efficient drive shaft installation and removal!

Take this ship, now in ferry service on the North Carolina Coast, as an example. Six pillow blocks were required to support two drive shafts. Since these shafts pass through bulkheads and are surrounded by other equipment, conventional pillow blocks are extremely difficult to install or replace. Engineers from our Dixie Bearings, Inc. Division recommended the *split right down to the shaft* pillow blocks shown above.

This bearing has found wide acceptance where it is impractical or impossible to mount a solid ball or roller pillow block without tearing down the whole machine. Not only did the original installation cost less, but maintenance costs will be greatly reduced.

This is just another instance of the many services Bearings, Inc. offers its customers. No matter what type of equipment you operate . . . if bearings are an important part of that equipment—we are ready and able to help you with any bearing problem you may have.

Providing bearing service in the territories adjacent to our branches, listed below.

BEARINGS, INC.

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute
PENNSYLVANIA: Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling
NEW JERSEY: Camden • **MARYLAND:** Baltimore
DELAWARE: Wilmington •
Subsidiaries: Balanrol Corp. • Buffalo, N.Y.•
In the South • Dixie Bearings, Inc.

which to consolidate part of its manufacturing operations now situated at Delavan and at Sharon, Ill.

Chase Brass & Copper Co., Waterbury, Conn., opened a new warehouse and district sales office at 230 Shaw Rd., South San Francisco, Calif. The building contains about 62,000 sq ft of space.

CONSOLIDATIONS

Midland Steel Products Co., Cleveland, and **J. O. Ross Engineering Corp.**, New York, will merge, subject to approval by shareholders next month. The consolidated organization will be known as Midland-Ross Corp. with executive offices in Cleveland. It will operate four divisions: Cleveland, Detroit, and Owosso (Mich.) divisions of Midland; and J. O. Ross Engineering Div., including the Ross subsidiaries.

Saxton W. Fletcher, president of Ross, will be president of the J. O. Ross Engineering Div. and a vice president of Midland-Ross.

Midland Steel produces frames, power brakes, and air compressors for transportation vehicles, and for construction and industrial machinery. The Ross organization (with its subsidiaries) engineers, designs, and manufactures atmosphere-control systems. It offers complete systems for finishing and painting products and makes a broad line of couplings, and coating and printing equipment.

Ray-O-Vac Co., Madison, Wis., is merging with **Electric Storage Battery Co.**, Philadelphia, and will be operated as the Ray-O-Vac Div.

Maysteel Products Inc., Milwaukee, purchased **Magnesium Products of Milwaukee** and will operate it as a subsidiary. The acquisition puts Maysteel in the magnesium field for the first time. Maysteel's products include office equipment, engine and compressor housings, circuit breaker tanks, vending machines, road and farm machinery components, lathe benches, hospital cabinets, and patient wardrobes. Its subsidiary, Gleason

Specify *Michigan* Tubing for economy and versatility

A Quality Product

ROUND

¼" to 4" O.D. 7 to 22 gauge

SQUARE	Gauge	RECTANGULAR
⅜" to ¾"	16 thru 22	⅜" minimum side to 5" maximum side
¾" to 1"	11 thru 22	
1" to 2"	11 thru 20	
2" to 3"	11 thru 18	

Carbon 1010 to 1025

Standard Sizes

Tube Diameter O.D. Size	Maximum Wall Decimal	BWG Gauge	Minimum Wall Decimal	BWG Gauge
¼	.065	16	.022	24
½	.083	14	.022	24
⅜	.095	13	.022	24
¾	.095	13	.022	24
⅞	.095	13	.028	22
1	.095	13	.028	22
1⅛	.095	13	.028	22
1¼	.095	13	.028	22
1⅜	.095	13	.035	20
1½	.120	11	.035	20
1⅝	.120	11	.035	20
1¾	.120	11	.035	20
1⅞	.180	7	.035	20
2	.180	7	.035	20
2⅛	.180	7	.035	20
2¼	.180	7	.035	20
2⅜	.180	7	.035	20
2½	.180	7	.035	20
2⅝	.180	7	.035	20
2¾	.180	7	.035	19
2⅞	.180	7	.042	19
3	.180	7	.042	19
3⅛	.180	7	.042	19
3¼	.180	7	.042	18
3⅜	.180	7	.049	18
3½	.180	7	.049	18
3⅝	.180	7	.049	18
3¾	.180	7	.049	18
3⅞	.180	7		
4	.180			

For 40 years

Michigan has been manufacturing tubular parts for leading manufacturers. This acceptance of Michigan tubing has been won by meticulous attention to customer requirements and the supplying of the very best in tubing. The following advantages of low cost manufacture and utmost dependability are yours when you specify Michigan for tubular parts in the fabrication of your products:

1. It is fabricated in round, square and rectangular shapes, in a wide range of sizes;
2. It is always of uniform strength, weight, ductility and weldability;
3. It can be flanged, expanded, tapered, swaged, beaded, upset, flattened, forged, spun closed, fluted and rolled.
4. Complete facilities for the COLD DRAWING, ANNEALING and TESTING of tubing we manufacture.

RESISTANCE WELDED STEEL TUBING
Michigan STEEL TUBE PRODUCTS CO.
THE OLDEST NAME IN ELECTRIC

Consult Michigan
for engineering and technical help in the selection of tubing best suited to your needs.

40 Years in the Business
9450 BUFFALO • DETROIT 12, MICH.
FACTORIES: Detroit, Michigan • Shelby, Ohio

DISTRIBUTORS: Steel Sales Corp., Chicago, St. Louis, Milwaukee, Indianapolis and Minneapolis—Miller Steel Co., Inc., Hillside, N. J.—Service Steel Div., Van Pelt Corp., Los Angeles, Calif.—Donald A. Harston, Cleveland, Ohio—Globe Supply Co., Denver, Colo.—W. A. McMichaels Co., Upper Darby, Pa.—William P. Hall & Associates, Dayton, Ohio—John Emery West, Miami, Florida—Gary A. Osborne, Buffalo, N. Y.—Earle M. Jorgensen Co., Houston, Texas

Everybody profits ...because

you belong

in this picture!

The publisher of this magazine is often asked what kind of a man you are . . . and how many like you are receiving his magazine.

Why is he asked?

Because the *advertisers* (whose money is his chief income) insist upon knowing the types of people (by industry or profession, by title) for whom the magazine is edited — and how many are getting it.

In order to standardize on the presentation of such information to advertisers and to have its accuracy vouched for by a disinterested third party, nearly 450 publishers have joined some 200 leading advertisers and advertising agencies in a non-profit organization called Business Publications Audit.

The purpose of BPA is to assure advertisers . . . by frequently checking and rechecking . . . that each member publisher is indeed distributing his magazine, in the *numbers* promised, to the *types* of men he promised would receive it.

The BPA symbol in this magazine means that *you belong* . . . that because of your occupational interests you are qualified, in the eyes of the advertisers, to receive it.

The advertiser can thus tell whether he's getting his money's worth.

The publisher has a better sales story to prospective advertisers because his magazine is "audited."

And you, the reader, get more value from the magazine because both the advertisers and editors, knowing what your special occupation is and what your interests are, are better able to prepare advertising and editorial material that will be most informative and useful to you.

What you can do

Publishers and advertisers frequently write to magazine readers to learn what kind of articles and advertisements appeal most. Cooperate with them — will you? — by answering their questions . . . in the interest of better communications between makers and markets.

BUSINESS PUBLICATIONS AUDIT OF CIRCULATION, INC.

420 Lexington Avenue New York 17, N. Y.

BPA

A NON-PROFIT, TRIPARTITE MEMBERSHIP CORPORATION OF ADVERTISERS, ADVERTISING AGENCIES AND BUSINESS PUBLICATIONS

Reel Corp., makes cable and hose reels. Magnesium Products makes dock boards, material handling specialties, portable radar towers and shelters, and airborne-electronic components and frames.

Wagner Bros. Inc., Detroit, producer of chemical supplies and automatic plating machines, purchased the **Automatic Molding Machine Co.**, Los Angeles.

Haveg Industries Inc., Wilmington, Del., purchased **Lithgow Chemical Co.** of California (Torrance), manufacturer and applicator of plastic coatings which resist chemical corrosion, cements, impregnations, and laminated linings. Haveg produces chemical-corrosive plastics and plastic coatings.

Gulton Industries Inc., Metuchen, N. J., acquired **Titania Electric Corp. of Canada Ltd.**, Gananoque, Ont. Operations of the Canadian subsidiary will include the manufacture of most of the major electronic and ultrasonic instruments and components produced by the parent firm. Dr. L. K. Gulton is president of the new subsidiary; Max Fallis, general manager.

Hubbell Metals Inc., St. Louis, purchased **Graco Steel Co.**, Louisville, distributor and processor of sheet and strip steel.

Graton & Knight Co. Inc., manufacturer of industrial leather products, purchased **Warren Belting Co.** and will operate the property as a division. Both firms are situated in Worcester, Mass. Plans include expansion of the Mechanical Packings Div., enlargement of the Case & Strap Div., and establishment of additional facilities for increased production of nylon core belting.

NEW ADDRESSES

Booz, Allen Applied Research Inc. (formerly Applied Research Inc.) moved its headquarters to 430 Green Bay Rd., Kenilworth, Ill. Dr. R. P. Petersen is president.

(*Please turn to Page* 158)

SUTTON presents outstanding
FARMER-NORTON Finishing Machines
Under license from Sir James Farmer Norton & Co., Ltd.

CENTERLESS BAR TURNING MACHINES

Now—U.S. plants can have automatic straight-line bar turning with the finish comparable to the finish of centerless grinding! Machines are fitted with a wide variation of feeds for either rough or precision turning. Ovality tolerances of plus or minus .00025" and a diameter variation better than plus or minus .001" in any 20' length, are achieved for precision turned bars with these machines.

Ask for complete data

Also available:
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PHONE: GRANT 1-8077 PLANT: BELLEFONTE, PA.
Manufacturers of Straighteners, Hydraulic Extrusion Presses, Centerless Bar Turners, Rotary Swagers, Sheet Levellers and other Finishing Machines for Modern Metals.

CINCINNATI PRECISION IS TAILORED* TO

At the Metal Show see the INDUCTRON

simultaneously hardening both ends of Chrysler push rods. Rods are 5/16" x 11.58", SAE 1056 steel. Special fixture feeds rods through work coils into oil quench.

all new inductron

INDUCTION HARDENING MACHINE

Cincinnati's new Inductron® offers more advantages in performance, flexibility, ease of operation, and reliability of component life than any similar equipment previously offered to industry. Built in 15, 30 and 50 KW capacities, these machines operate at frequencies up to approx. 1000 KC for faster heating, thinner case, greater freedom from scale and distortion.

All units are wired and equipped to operate on either voltage, 220/440. Power, in the smoothest form of d.c. possible, is adjustable over the entire range, using only a basic rectifier circuit with low-cost, long-life rectifier tubes. The standard Inductron has a manually adjustable output transformer to accommodate a wide range of workpieces. A self-contained, externally variable output RF transformer can be provided at extra cost. The feed back (grid drive) system is self-regulating and requires no adjustment when changing work coils or transformer position, over the entire power range.

Many more design advantages—in component and circuitry construction, in controls and instruments—are incorporated. Throughout, the new Cincinnati Inductron assures you highest operating efficiency with maximum component life.

***BUILDING BLOCK CONSTRUCTION**

CINCINNATI

flamatic and inductron

hardening machines

in Action at the

METAL SHOW

SELECTIVE HEAT TREATING YOUR REQUIREMENTS!

all new flamatic

FLAME HARDENING MACHINE

High machine flexibility for the flame hardening of an even wider range and diversity of parts . . . *at greater-than-ever-economies* . . . is the keynote of this new Cincinnati Flamatic®.

The standard machine is built with a functional, flat bed design—having large, open area—on which any one of a wide variety of tooling and work-handling systems can be located. Thus the basic machine becomes highly adaptable to a large range of work that previously fell in the "special or modified-standard" machine class.

Other provisions include precision electronic temperature control system; compact, all-inclusive control cabinet; integral quench tank with high-capacity heat exchanger, quench agitation system, and large discharge conveyor that integrates with plant conveyor systems.

As before, Flamatic gives you a wide choice of fuel gas, easy set-up and operation, automatic heating to pre-set temperature, uniform results, with top calibre construction that provides the utmost in freedom from downtime.

When you have parts requiring selective surface hardening or other heat processing, you'll profit by talking to Cincinnati . . . builders of *both* flame and induction hardening machines. Call in a Process Machinery Division field engineer. He is ideally equipped to evaluate your needs and give you unbiased recommendations as to the most economical and efficient equipment for your work.

At the Metal Show see the FLAMATIC

simultaneously spot hardening both cup and pad sections of automotive rocker arms, six parts at a time . . . a typical adaptation of the standard unit. Part material is nodular iron. Timed cycle is automatic, except for loading of the fixture.

BOOTH NO. 1798
CHICAGO AMPHITHEATRE
NOV. 4-8

PROCESS MACHINERY DIVISION

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

HERE'S HELP for your tooling problems

Looking for a tool steel to do a specific job? Want to know where to buy a finishing carbide? This guide has the answers. It is a single source of information on more than a thousand different tooling materials. Knowing the job to be done, you can determine, with the guide, what product to buy and where to buy it. Cross indexes make it easy to locate tool steels and carbides by tradename, or to compile a list of sources for a single type.

40 PAGES

Copies of the Guide to Tool Steels & Carbides are available from Editorial Service, STEEL, Penton Bldg., Cleveland 13, O.. at the following prices:

1 to 10	$2.00 ea.	51 to 100	1.80 ea.
11 to 50	1.90 ea.	101 to 200	1.70 ea.
		over 200	1.60 ea.

(*Concluded from Page* 155)

Production Machinery Corp., Mentor, Ohio, moved its engineering and sales offices to larger quarters at Maple Street and Nickel Plate Railroad, that city. The firm builds metal processing equipment.

A. K. Allen Co. Inc. moved to larger quarters at 255 E. Second St., Mineola, N. Y. The firm makes air cylinders, air valves, and indexing dial feed tables.

Automotive Engine Rebuilders Association moved its main office to 901-903 Roosevelt Bldg., 9 N. Illinois St., Indianapolis 4, Ind.

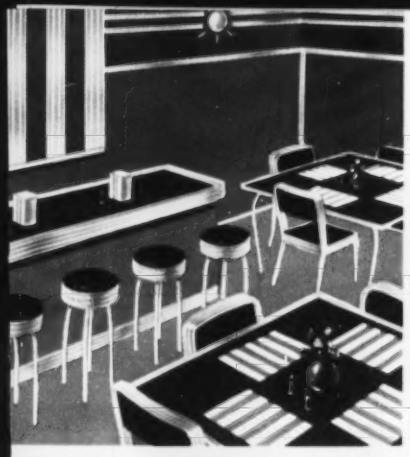
ASSOCIATIONS

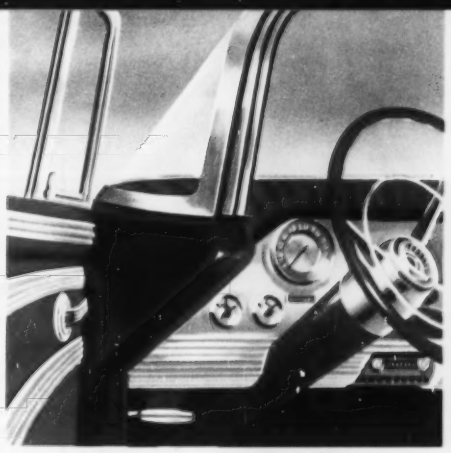
N. P. Hayes, president of Carolina Steel & Iron Co., Greensboro, N. C., was re-elected president of the **American Institute of Steel Construction Inc.**, New York. Other officers who also were re-elected are: First vice president, H. B. Dietrich, Dietrich Bros. Inc., Baltimore; second vice president, J. M. Straub, Fort Pitt Bridge Works, Pittsburgh; treasurer, E. P. Stupp, Stupp Bros. Bridge & Iron Co., St. Louis. M. Harvey Smedley is secretary, while L. Abbett Post is executive vice president.

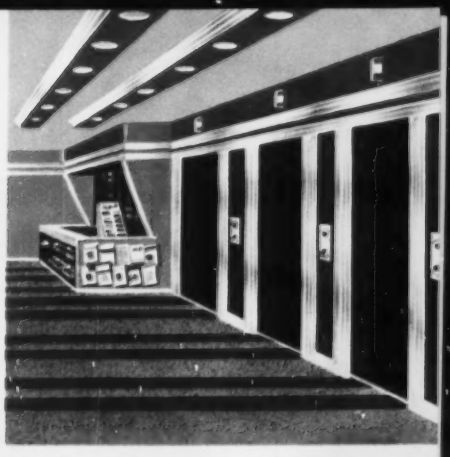
W. M. Goldsmith, secretary-treasurer of the Dave Chapman Industrial Design office of Chicago, was elected president of the **American Society of Industrial Designers**, New York.

Roland J. Ahern, president and general manager of the Billings & Spencer Co., Hartford, Conn., was elected president of the **Service Tools Institute**, New York.

Pennsylvania Ceramics Association, Pittsburgh, elected these officers for two-year terms: President, Ernest M. Hommel, O. Hommel Co., Pittsburgh; first vice president, John Clark, Foote Mineral Co., Philadelphia; second vice president, George Reuning, Big Savage Refractories Corp., Frostburg, Md.; managing director, J. K. Martin, Posey Iron Works Inc., Lancaster, Pa.



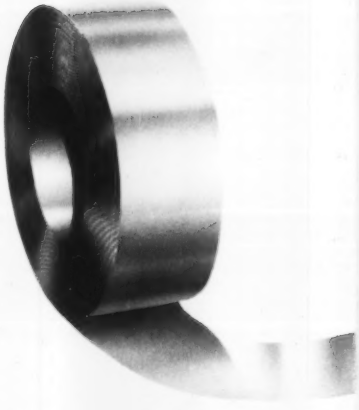




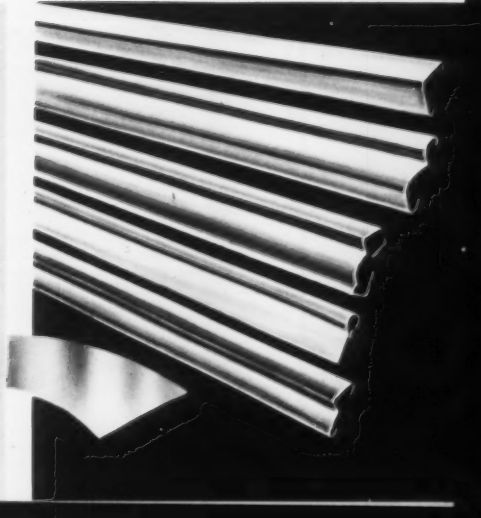
indoors or out—
the accent is STAINLESS
the meaning is PROFIT

mouldings of Superior Stainless

STRIP STEEL



The bright world of applications for mouldings of Superior Stainless tells the story fast: *wherever these mouldings are used, profit is part of the picture!* Profit in fabrication, through Superior's uniform ease of working . . . profit in sales, from outstanding value appeal . . . profit in customer satisfaction, which builds more business! ● Let us send you the Superior Stainless Strip Steel Brochure.



Superior Steel
CORPORATION
CARNEGIE, PENNSYLVANIA

The range that loves it at the seashore

Salt air is a tonic to most people. But it's murder to unprotected metal. And a tough test for the Tinnerman SPEED NUTS that fasten the panels and handles of home appliances like this range.

To make sure that the finishes developed by Tinnerman will fully protect SPEED NUT® Brand Fasteners, we test them in our own salt-spray tank.

From this device at the Tinnerman laboratories have come scores of protective finishes for any type of exposure—road salt under automobiles, corrosive fumes around industrial electronic devices, detergents in home-laundry equipment, and others.

Only Tinnerman can give you so much protection. Over 150 finishes keep 8000 different shapes and sizes of Tinnerman SPEED NUTS on the job in every kind of climate and service.

Send for "A Story of Quality", to learn about all the Tinnerman laboratory facilities. Write to:

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Box 6688 • Dept. 12 • Cleveland 1, Ohio

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Speed Nuts®

FASTEST THING IN FASTENINGS®

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STEEL
The Metalworking Weekly

The Metal Show Section

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The 2nd World Metallurgical Congress and 39th National Metal Exposition

Metal Selection Puts Plus in Profits

EACH YEAR brings a crop of new alloys.

Many are modifications of the familiar that accent some vital property. Some reflect improved technology in production. A few are all new.

The problem is to keep current. Many of the new ones develop into important engineering materials that obsolete their competitors. That's a consideration of consequence when you realize that materials can be the biggest single item of cost in the manufacture of a product.

It means management must be sure its people are informed . . . that they are selecting and buying the best metal for an application in its most economical form.

STEEL's Metal Selector (opposite Page 168) was developed to help you do a better job in materials management. It compiles data on types and uses of many alloys needed in today's manufacturing.

Included are tables on: 1. Wrought and casting copper alloys. 2. Wrought and casting aluminum alloys. 3. Ferrous castings. 4. Magnesium. 5. Titanium. 6. Zinc diecasting alloys. 7. Alloy and H-steels. 8. Stainless and heat resistant steels.

This Selector supplements last year's (STEEL, Oct. 1, 1956, opp. p. 162), which dealt with special alloys: 1. High strength, low alloy steels. 2. Superstrength steels. 3. Leaded steels. 4. Vacuum melted metals. 5. High temperature alloys. 6. Corrosion and heat resistant castings. 7. Spring alloys. 8. Special copper alloys. A new edition of last year's Selector for Special Alloys is planned for the 1958 Metal Show issue.

Alloy and H-Steels

Today, 188 types of alloy and H-steels are designated as standard by the American Iron & Steel Institute.

Studies by AISI in co-operation with the Society of Automotive Engineers have resulted in this simplified list of compositions for engineering applications. Previously, many more analyses were in use. In many cases variations in their compositions were too small to be of any real significance.

The 1955-57 period saw further standardization of the standard alloy and H-steels. Although a few new compositions were added (including a nitriding steel), this year's Selector has 50 less alloys than the 1955 edition.

Definition of Alloy—One or more alloying elements are added to pro-

duce properties that cannot be obtained in carbon steel. Generally, it's advisable to use alloy steels when requirements call for more strength, ductility, and toughness than can be obtained from carbon steel in the section under consideration.

Trends — Steels such as 2300, 2500, and some of the 3100 grades were dropped from the new AISI-SAE lists because users had trouble getting them during the nickel shortage. They turned to other alloys and increased the carbon content to get the hardenability they needed.

A new alloy with no nickel, 4012, has replaced 4608 for use in bearings. Alloy 8822 has been added to take the place of some 4800 steels and conserve nickel.

Some of the 8700s were taken out because 8600s can be used instead in some applications and are cheaper because of their lower molybdenum content.

Triple Alloys—Nickel-chromium-molybdenum steels may offer economy in use over cheaper single alloy compositions. For example, residual nickel, chromium, or molybdenum in a single alloy steel will vary from heat to heat. Potential areas of trouble include variations in hardenability, annealing difficulties, and distortion in heat treating.

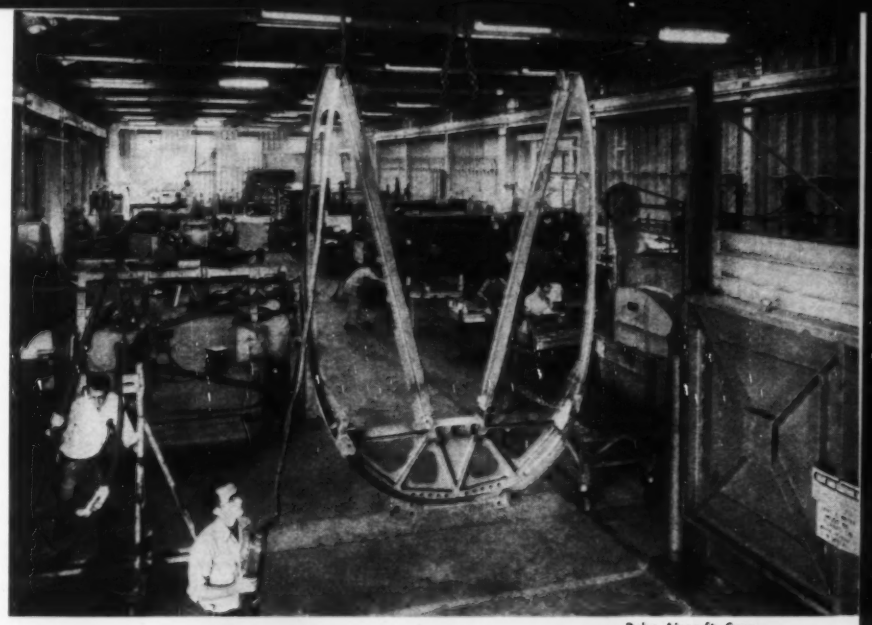
The extra cost of a composition in which nickel, chromium, and molybdenum are controlled can be repaid several times by more uniform heat treating results.

Boron—It's added to steel for one purpose: To increase hardenability. Such steels are identified by the letter B in the grade number and contain a minimum of 0.0005 per cent boron.

Boron is valuable for increasing the hardenability of leaner alloys. It's used most frequently in the 0.30 to 0.50 per cent carbon range. Grades 94B30 and 94B40 are used for spindles and axles. Makers of hand tools are using boron grades.

Caution—It's not good practice to chose an "overalloyed" grade for a small section. It may increase susceptibility to quenching cracks.

Through-hardening may be undesirable for some uses, such as shock applications. A softer core is needed to avoid breakage.



Rohr Aircraft Corp.

Alco Products Inc.

More Alloy Steels Go Into Aircraft and Missiles—Top photo shows fuselage main bulkhead, an alloy steel weldment heat treated to 180,000-200,000 psi ultimate. Bottom photo shows air flask for the Terrier missile being machined from 4340.

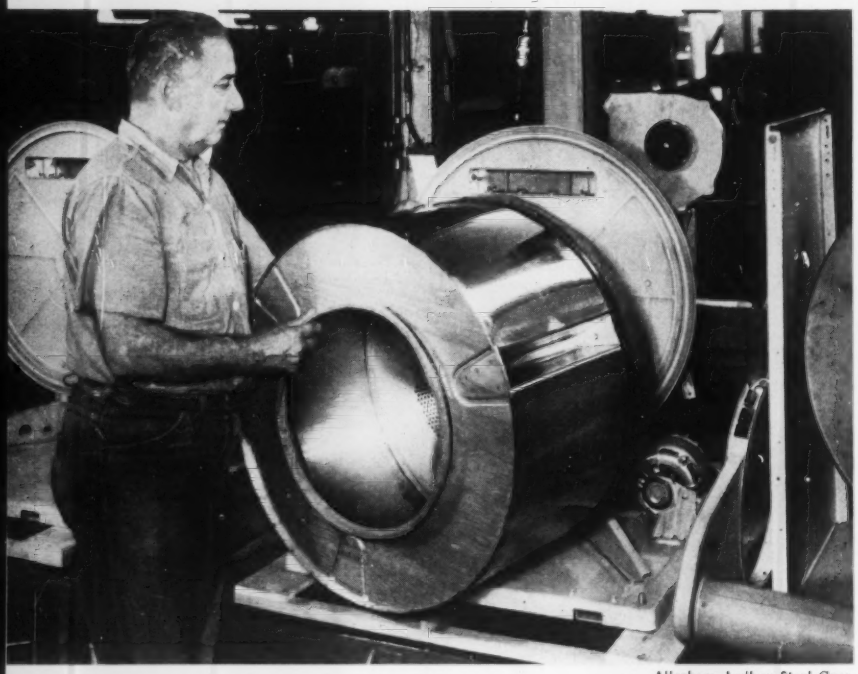
Factors in addition to hardenability often are pertinent. They arise when service conditions such as heavy shock, low temperature impact, and creep resistance are involved.

Specify—To identify steels specified to hardenability band limits, the suffix H is added to the regular series number. It's important that purchasers use the suffix when they specify; there is no other way to determine when hardenability band limits apply.

Aircraft—More alloy steels are finding their way into aircraft. Specifications are demanding higher transverse properties. Steel companies are accepting requests for 12 per cent reduction in area at the 260,000 to 280,000 tensile strength level. Physical property requirements are expected to go higher.

Stainless Steels

There are 39 grades of stainless and heat resistant steels designated as standard by the American Iron



Allegheny Ludlum Steel Corp.

Stainless Series 200 Finds New Uses—Type 201 is used for drum going into home laundry dryer

& Steel Institute. Many other stainless alloys are available commercially under several tradenames. (They were covered in STEEL's Metal Selector last year.)

Spur to Growth—Stainless alloys are growing rapidly in number because of the need for new materials of construction for hot aircraft, atomic reactors, and missiles. Fabricators are using more of it in industrial and domestic applications.

Auto Uses—Stainless is finding more functional uses in automotive parts. Last year, three applications passed from the development to the acceptance stage: An oil ring expander, radiator tanks, and oil cooler assemblies.

Architectural applications are taking more stainless—as prefabricated panels that are assembled to form walls and as decorative trim.

Fabricators are making more stainless products for the farm. Refrigerated tanks for handling fresh milk in large quantities have been on the scene for some time. A liquid fertilizer dispenser is being introduced.

The refrigerated milk dispenser is one of the most promising new products. Commercial models are being used in schools and restaurants. Scaled-down versions for the home will keep milk "on tap," releasing space taken by containers for other uses.

The new types 201 and 202 are receiving more attention by fabricators using them as alternates for the higher nickel austenitic grades. They are finding use in railway cars, truck bodies, restaurant and institutional equipment, household utensils and appliances, and several architectural applications, such as exterior panels, window frames, doors, hardware, and elevator panels.

The designer should be familiar with the whole family of stainless steels. Intelligent selection can pay off in design improvements and cost savings.

Aluminum

A new heat treatable alloy, X6463, gives the brightest finish ever obtained on a commercial aluminum extrusion. Automotive, architectural, and appliance users will adopt it for bumpers, grilles, trim panels, window frames, emblems, and lettering.

More Strength — Plates rolled from 5456 have the highest mechanical properties available among alloys that are not heat treatable. The alloy meets U. S. Navy specifications, has good resistance to corrosion, and excellent welding characteristics. It's well suited for overhead traveling cranes, ship unloaders, gun mounts, carrier elevators, deckhouses, and other heavy duty structures.

The development of alloys 5083 and 5086 has spurred the fabrication of complex structures requiring maximum joint strength and efficiency. Applications are in cranes, trusses, bridges, elevated water tanks, drilling rigs, military vehicles, trucktrailers, railroad car doors, and other transportation equipment.

Alloy X5454 was developed for the fabrication of strong welded structures which must operate at slightly elevated temperatures. Its main application is expected to be in the process industries where heated chemicals are handled in aluminum tanks, truck dump boddies, tubes, and pipe.

Strip Conductor — Electrical equipment makers are studying the use of aluminum strip conductors for such things as welder transformer coils, lift magnet and magnetic clutch coils, and dry type distribution transformers.

Interleaved strip conductors have been approved for use in generator field coils by one automaker; a producer of electrical equipment has approved them for automobile transformers. Development work on horn coils is nearing completion.

Transportation — Automakers are planning to use more aluminum in functional and decorative parts. Some applications: Air cleaners, front crossmembers for radiators, hood latch assembly, hand brake levers, hub caps, door scuff plates, and cooling systems. Look for aluminum bumpers, roof panels, and wheels in the near future. Diecast wheels and engine blocks are under consideration.

Truck and bus builders are using aluminum in body construction, hubs, brake shoes, axle and differential housings, and frame supports. Structural parts and trim are going into house trailers, fur-

nishings, windows, awnings, roofs, and doors.

Railroad applications are receiving more attention. Doors for boxcars, baggage and refrigerator cars, floors and floor racks, loader beams, and other parts are in the test stage. Aluminum hopper cars are being produced.

In conventional aircraft, aluminum is the plane designer's chief metal. New alloys and more efficient forms are being developed to meet specific requirements.

Castings Keep Up — Usage of aluminum casting alloys with higher mechanical properties is proceeding in two directions: 1. Those which offer high strength and high ductility in the as-cast condition are being specified. 2. Heat treatment is being used to give a wide range of high mechanical properties.

The high purity alloys, HP355 and HP356, are of interest to aircraft and missile builders because of their higher strength and ductility.

Piston Alloy—There has been a marked trend away from SAE 321 for pistons; SAE 332 or ASTM SC103A has recently been specified by the SAE and ASTM. Use of aluminum-tin bearing alloys 750 and 700 is growing.

More Zinc Added—In the last few years there has been a strong trend toward the use of more zinc in aluminum casting alloys for sand, permanent mold, and diecasting applications. Many diecasters are using alloys with 2 per cent or more zinc. The chief advantage of higher zinc is better machinability; it also increases the fluidity of the casting.

Magnesium

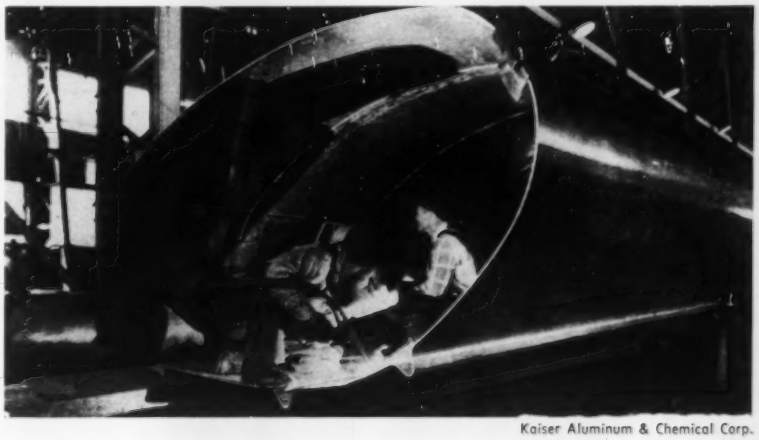
Military standard 409 was issued by the office of the assistant secretary of defense on Feb. 14 to standardize nomenclature and temper designations for magnesium alloys in industry and the Department of Defense. The Army, Navy, and Air Force make its use mandatory.

The alloy nomenclature is based on the system devised by the ASTM and officially adopted by the Magnesium Association.

Progress—New magnesium alloys have been developed for higher strength and elevated temperature applications.

Alloy ZK60A produces high strength extrusions. Pellet material (alloy ZK60XB-B) is being extruded in cross-sectional areas up to 20 sq in. Sections are some 40 per cent stronger than those extruded from conventional billets.

About 4300 lb of pellet-extruded I-beams support the flooring in Douglas Aircraft Co.'s big C-133



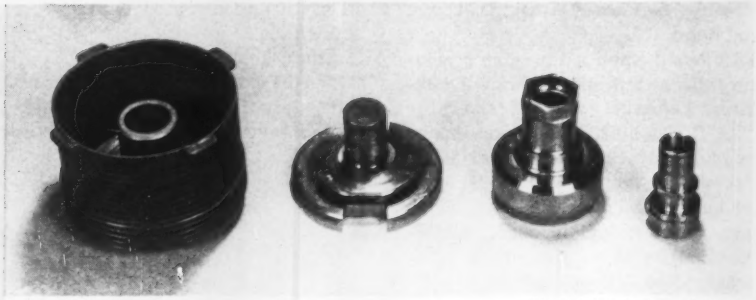
Kaiser Aluminum & Chemical Corp.

Aluminum Co. of America

New Aluminum Alloys Have Tailored Properties—Top photo shows tank shell of alloy 5086 being welded. It was recently accepted by the ASME for unfired pressure vessels. Trailer in bottom photo is made from 5154 because of its weldability and high strength

TITANIUM

New high strength, heat treatable alloys are ready for aircraft and missiles. Civilian market will take more for anticorrosive uses



Titanium Metals Corp. of America

Cylinder and piston parts for bomb ejector made from high strength, heat treatable bar and forging alloy (Ti-155A)

cargo carrier and transport

Heat Resistance — Magnesium alloys containing thorium (HK31) give castings, extrusions, and sheets improved short time tensile properties at 800° F. Creep resistance is improved up to 700° F, and applications in the 300 to 500° F range are extended.

More than 230 lb of magnesium-thorium alloys are used in the airframe and skin of the Bomarc missile.

Zinc Diecastings

ASTM alloys AG40A and AC41A (Zamak 3 and 5) differ only in copper content. They fill requirements for diecasting applications.

The design engineer is calling for parts that require complex dies, the ingenious use of inserts, and the casting of shapes that formerly "couldn't be done." Typical are: Helical gears, feed screws, cored openings on all sides of the casting, different size parts from the same die, and dies that form a complete set of parts, including fasteners, for an entire assembly.

Zinc diecastings are finding these uses in industrial equipment: Heavy duty gear reducers, forced lubrication systems, high speed sewing machines, electric staplers, and spiral feed screws.

New devices for autos use their share. Typical are: Window channels for hardtops, the extension assembly for the window portal, and controls and housings for air conditioners.

Toymakers are using zinc diecastings for pistols, airplanes, autos, tractors, rifles, and trucks.

Titanium

The change in emphasis from piloted aircraft to missiles opens up new uses for this metal—particularly the new heat treatable sheet alloys being introduced.

About two-thirds of the titanium produced for aircraft goes into jet engines; about 10 per cent finds its way into the airframe. It means that the alloys have useful strength to about 900° F and offer weight-saving possibilities at these temperatures.

Missile speeds will be in the thousands of miles per hour, and temperatures produced by aerodynamic heating will rise accordingly. The missile airframe will get hot. The problem will be comparable to the present one on airplane jet engines. Titanium alloys will give the designer valuable strength-weight-temperature properties to work with.

Civilian Move—While principal uses for the immediate future will be in aircraft and missiles, in five to ten years more titanium will probably be used by industry than by aircraft. It's already doing a number of important jobs more economically than other metals—and at today's prices.

Anodizing rack clips are being made from a commercially pure grade. They resist corrosion and do not become nonconducting during anodizing, which saves an extra operation (stripping the rack between cycles).

Outstanding—Corrosion properties make the material stand out for a number of uses in chemical processing and paper mill equipment. It's expected to make important moves into the food equipment field.

Producers of mill products are building up stocks for industrial applications. Reliable sources of supply are developing for tubing, welded fittings, valves, fasteners, flanged heads, and other items required by industry for building equipment.

Ferrous Castings

Users are becoming more specification minded about the quality and properties of castings.

Gray iron is produced with a wide range of mechanical properties. It's a material that may be adjusted by changes in composition, heat extraction, or heat treating.

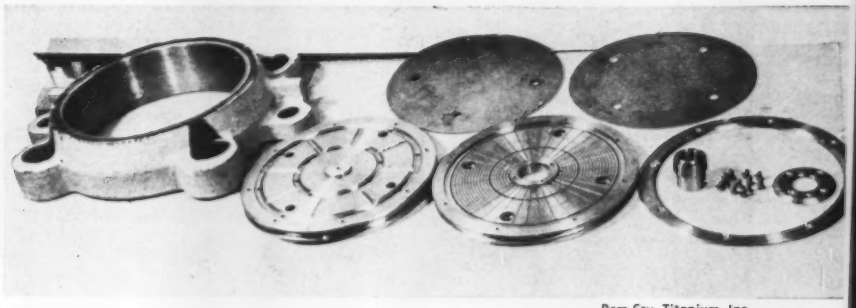
It's actually a composite material with both metallic and nonmetallic constituents. It can be thought of as a steel interspersed with graphite. Since graphite is structurally weak, its quantity, character, and distribution have an important effect on the physical properties with which designers are concerned.

Cheapest—Generally, a gray iron casting will cost less if it will do the job. A design modification may allow its use. But where ductility or higher impact strength is needed, the designer will have to go to a more expensive material.

The machinability of gray iron is a cost saving feature. Excellent castability is another plus. It helps to maintain design flexibility.

Castability and machinability decrease as tensile strength increases. The overcautious engineer is wasting money when he specifies a

Mallory-Sharon Titanium Corp.
Pumpshaft made of pure titanium (MST Grade III) beats corrosion



Rem-Cru Titanium Inc.
Contact parts of filter press are made from commercially pure metal to handle corrosive slurries of calcium hypochlorite

higher tensile strength iron than he needs.

Ductile Iron—This cast ferrous material has the processing advantages of gray iron (good fluidity, castabiilty, ready machinability, and low melting point) and many of the engineering advantages of steel (good strength, toughness, wear resistance, and substantial ductility).

As mentioned, the chief factor which limits strength and ductility in gray iron is the presence of random graphite flakes. With the addition of a little magnesium, the graphite in nodular iron takes the form of small nodules or spheroids. They make a stronger, tougher, more ductile casting.

Applications for nodular iron have grown rapidly, and specifications have been drawn up to assist users in getting the proper grade for the job. Heat treatment is often used to bring out needed properties.

Jobs It Can Do—Where pressure tightness is needed, nodular iron casting can be used for such parts as pipes, and cylinder and compressor heads.

Where toughness is needed, it can be used for castings subject to moderate impact or shock, such as gears, pulleys, and transmission cases.

Where wear resistance is needed, it can be used for parts such as brakewheels, plow shares, and packing rings.

Malleable—The automotive industry uses about half the malleable iron castings produced. The other half goes to such diverse fields as railroad and agricultural equipment, machinery, electrical fittings and equipment, and ordnance.

Malleable iron has unique properties. At the top of the list are high toughness, ductility, and good resistance to atmospheric corrosion. Sound castings can be made in complicated forms over a wide range of weights and sizes because of the material's excellent machinability and good castability.

Standard and Pearlitic—Standard malleable accounts for the largest tonnage, but in the last few years pearlitic has shown remarkable growth. It is due to high strength and performance characteristics once associated with carbon steel castings or forgings.

The various grades of standard and pearlitic malleable iron provide a wide range of minimum ultimate tensile strengths and minimum yield strengths. They offer impressive ratings in a long list of physical and mechanical properties. High ratio of yield point to ultimate strength and ease of machining also interest designers.

Choice—The different grades of nodular iron and pearlitic malleable have a fairly comparable range of physical properties. One company has set forth this rule of thumb for selection: Nodular iron is usually more feasible in heaver section castings; in lighter castings (under ¾-in. wall section), malleable or pearlitic malleable is a better choice.

Steel Castings—Here is a product that is especially adapted to withstand complex stresses in shapes which are difficult to obtain by other methods. Once the function of a proposed design is established, the steel casting engineer can work with the designer toward acceptable, commercial, or specification quality in keeping with safety factors and weight or size limitations.

A recent method of determining design is to analyze the function of the part using strain gages or some other similar method. However, a large percentage of steel castings are produced for commercial items where design costs such as this cannot be justified.

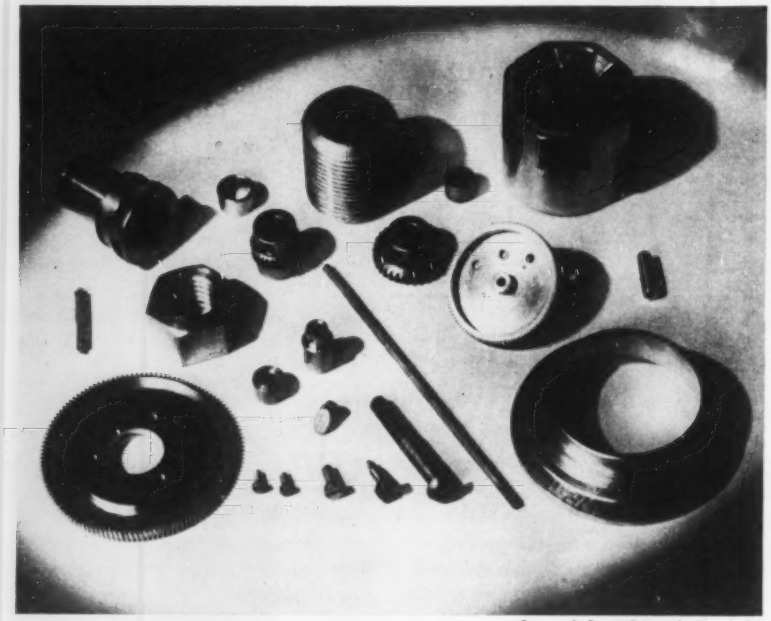
Specs—The Steel Founders' Society of America recommends the use of ASTM specifications. They cover mechanical properties, methods of testing, radiographic examination, and magnetic particle inspection.

Properties listed in specifications are generally exceeded when production heats are tested. The specification identifies the material needed for low safety factor design.

A wide variety of properties can be produced in steel and the same applies to steel castings. Commercial steel castings are available with strengths above 200,000 psi; some special compositions and treatments are being used to give strengths which approach the 300,000 psi range.

Upgrading — Established design which must be used in equipment subjected to heavier loads frequently can be upgraded by a steel casting. Often it's desirable to modify the design to benefit from the greater strength of cast steel and save weight.

Established design for a steel casting also can be upgraded by the use of alloys or heat treatment. For extreme temperature ap-



Copper & Brass Research Association

Copper Alloys Gain Special Properties—Phosphor bronze rod used for these screw machine parts contains lead to help machinability

plications, they are used at −300 to 1150° F.

Designers accept the fact that properly selected cast steels produced to high quality standards will perform well. The important thing for the user to keep in mind is to be sure that properties and design stresses required are identified.

Copper

The alloys listed in the wrought copper chart are standard in the sense that over a period of years they have been the ones most commonly ordered in large quantities by consumers. There also are many special and proprietary alloys which are produced for a number of uses.

Good machinability is offered by many copper base alloys. Other useful properties: Excellent corrosion resistance, high electrical and thermal conductivity, and low magnetic permeability.

They have a broad range of attractive colors, which includes the red of copper, the yellow of brass, and the silvery-white of nickel silver.

Mechanical Properties — The broad range available makes possible several tempers for applications requiring high strength and hardness, plus ductility. Some alloys have excellent hot and cold working properties.

Alloying elements are sometimes added to bring out properties. Aluminum added to brass improves its resistance to impingement corrosion from turbulent water or other fluids flowing at high velocity and increases its strength. The addition makes it a more useful material for condenser and heat exchanger tubes.

A small amount of silicon in aluminum bronze increases its strength, corrosion resistance, and machinability. It makes it better for forgings and extrusions where high tensile strength is needed.

Copper Casting Alloys — The ASTM classification is based on the range of principal elements. Brasses include a large number of alloys in which the chief element other than copper is zinc. They are used where an economical, moderately corrosion resistant metal is needed for pressure castings and general applications.

Bronzes—Tin is the chief alloying element—with or without zinc, lead, and nickel. In general, the strength and hardness of the material are better than those of the brasses, and they are used where structural strength and wear resistance as well as corrosion resistance are required.

Leaded bronzes and brasses are more easily machined than those without lead. Lead additions also enhance pressure tightness in the interdendritic tin bronzes. A tensile strength of 100,000 psi is possible.

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- Stainless Steels
- Copper Casting Alloys

Metal Selector

1957 STEEL

October 28, 1957

Here is the practical information needed to help you select the right metal for the job. The more special alloys, covered last year, will be brought up to date in 1958

COPPER Wrought Alloys

Alloy & Nominal Composition[1]	Forms[2]	Machinability[3]	Properties & Applications
COPPERS:			
Electrolytic tough pitch (Cu 99.92; O 0.04)	R,D,S,W,T	20	Electrical, thermal conductor. Radiators, wire, flashing.
Deoxidized (Cu 99.94; P 0.02)	R,D,S,T	20	Forming, bending good. Plumbing, refrigeration oil lines.
Oxygen-free copper (Cu 99.92 min)	R,D,S,W,T	20	Deep drawing. Glass-to-metal seals, electronics, bus bars.
BRASSES—Nonleaded:			
Gilding, 95% (Cu 95; Zn 5)	R,D,W	20	High polish, base for gold plate. Jewelry, emblems, medals.
Commercial bronze, 90% (Cu 90; Zn 10)	R,D,W,T	20	For cold working. Compacts, lipstick cases, screws.
Jewelry bronze, 87.5% (Cu 87.5; Zn 12.5)	R,W	30	Base for gold plate. Zippers, plaques, chains, jewelry.
Red brass, 85% (Cu 85; Zn 15)	R,D,W,T	30	Resists corrosion. Heat exchangers, trim, conduit, dials.
Low brass, 80% (Cu 80; Zn 20)	R,D,W	30	For deep drawing. Bellows, musical instruments, dials.
Cartridge brass, 70% (Cu 70; Zn 30)	R,D,W,T	30	Good ductility, strength. Cartridge cases, springs, pins.
Yellow brass (Cu 65; Zn 35)	R,D,W	30	Cold workability & corrosion resistance. Lamps, hinges.
Muntz metal (Cu 60; Zn 40)	R,D,W,T	40	High strength, low ductility. Condenser plates, forgings.
LEADED BRASSES:			
Leaded coml. bronze (Cu 89; Pb 1.75; Zn 9.25)	D,S	80	Screw machine parts, screws, pickling crates, buckles.
Low-leaded brass (tubing) (Cu 66; Pb 0.5; Zn 33.5)	T	60	Good machinability, moderate cold workability. J-bends, pipe, fuse parts, pump liners, trap tubes.
Low-leaded brass (Cu 65; Pb 0.5; Zn 34.5)	R	60	Hardware (butts, hinges, sink strainers), watch backs.
Medium-leaded brass (Cu 65; Pb 1; Zn 34)	R,D,S,W	70	Hardware (butts, gears) clock plates, dials, nuts.
High-leaded brass (tubing) (Cu 66; Pb 1.6; Zn 32.4)	T	80	Fabricated by machining, piercing, punching. General purpose screw machine products.
High-leaded brass (Cu 65; Pb 2.0; Zn 33.0)	R,D	90	Free machining with good blanking properties. Name-plates, keys, lock parts, gears, clock & watch parts.
Extra-high-leaded brass (Cu 63; Pb 2.5; Zn 34.5)	R	100	For blanking, machining, piercing, stamping; clock plates, nuts, clock & watch backs, clock gears, wheels.
Free-cutting brass (Cu 61.5; Pb 3; Zn 35.5)	D,S	100	High speed screw machine parts. Gears, pinions, drilling.
Leaded Muntz metal (Cu 60; Pb 0.6; Zn 39.4)	R	60	Improved machinability. Condenser tube plates.
Free-cutting Muntz metal (Cu 60; Pb 1; Zn 39)	T	70	Improved machinability. Automatic screw machine parts.
Forging brass (Cu 60; Pb 2; Zn 38)	R,D,S	80	Plastic when hot. Forgings, pressings of all kinds.
Architectural bronze (Cu 57; Pb 3; Zn 40)	D,S	90	For forging, free machining. Extrusions, moldings, trim.
TIN & ALUMINUM BRASSES:			
Inhibited Admiralty (Cu 71; Zn 28; Sn 1)	R,W,T	30	Strength, ductility, corrosion resistance. Condenser, heat exchanger tubes & plates; auto aerials, marine uses.
Naval brass (Cu 60; Zn 39.25; Sn 0.75)	R,D,S,W,T	30	Marine uses, condenser plates, shafts, valve stems.
Leaded naval brass (Cu 60; Pb 1.75; Zn 37.5; Sn 0.75)	D,S	70	Like free cutting brass with more corrosion resistance, strength. Marine parts, valve stems, bolts.
Manganese bronze (A) (Cu 58.5; Fe 1; Zn 39.2; Sn 1; Mn 0.3)	R,D,S,W	30	Wear resistance, high strength. Clutch discs, pump rods, valve stems & bodies, coal screens, condenser plates.
Aluminum brass (Cu 76; Zn 22; Al 2)	T	30	Resists impingement. Condenser & heat exchanger tubes.
Aluminum bronze, 5% (Cu 95; Al 5)	T	20	Resists impingement. Condenser & heat exchanger tubes.
Aluminum silicon bronze (Cu 91; Al 7; Si 2)	R	60	High tensile, resists corrosion. Forgings, extrusions.
PHOSPHOR BRONZES (Tin Bronzes):			
Phosphor bronze, 5% (A) (Cu 95; Sn 5)	R,D,W,T	20	High tensile, resists corrosion, season cracking. Bourdon tubing, diaphragms, switch parts, washers, springs.
Phosphor bronze, 8% (C) (Cu 92; Sn 8)	R,D,W	20	For more severe conditions than above.
Phosphor bronze, 10% (D) (Cu 90; Sn 10)	R,D,W	20	Extra spring qualities, resists fatigue. Expansion plates.
Phosphor bronze, 1.25% (E) (Cu 98.75; Sn 1.25; P trace)	R	20	Good hot working properties but requires careful control. Low duty contacts & springs, hose, cold heading stock.
Free-cutting Phosphor Bronze (Cu 88; Pb 4; Zn 4; Sn 4)	R,D	80	Good cold workability, improved machinability. Bearings, bushings, gears, pinions, shafts, thrust washers, valve parts.
CUPRO-NICKEL & NICKEL SILVERS:			
Cupro-nickel, 30% (Cu 70; Ni 30)	R,D,T	20	Strength, ductility, corrosion resistance. Condensers, meters, plates, heat exchanger tubing, salt water tubing.
Cupro-nickel, 10% (Cu 88.7; Fe 1.3; Ni 10)	R,T	20	Resists salt water. Condenser tubing & plates, pipe.
Nickel silver, 65-18 (Cu 65; Zn 17; Ni 18)	R,D,W	20	Deep drawing, resists tarnish. Zippers, flatware.
Nickel silver, 55-18 (Cu 55; Zn 27; Ni 18)	R,D,W	30	Spring stock, resists fatigue. Springs, diaphragms.
Nickel silver, 65-15 (Cu 65; Zn 20; Ni 15)	R	20	Resists tarnish; hollow ware, nameplates, camera parts.
Nickel silver, 65-12 (Cu 65; Zn 23; Ni 12)	R,W	20	Deep drawing. Hollow ware, slide fasteners, trim.
Nickel silver, 65-10 (Cu 65; Zn 25; Ni 10)	R,W	20	Similar to above. Screws, flatware, platers' bars.
SILICON BRONZES (Copper-Silicon Alloys):			
High-silicon bronze A (Cu 96; Si 3)	R,D,S,W,T	30	Corrosion resistance of copper; physicals of mild steel. Hydraulic lines, tanks, bolts, screws, pole line hardware.
Low-silicon bronze B (Cu 97.7; Si 1.5)	R,D,S,W,T	30	Cold headed bolts, nuts, screws; clamps, cotter pins.

1. Only major elements listed.
2. Abbreviations:
   R—Rolled flat products.
   D—Rod and drawn flat products.
   S—Shapes.
   W—Wire (except flat).
   T—Tubing.
3. Basis: Free-cutting brass=100.

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FERROUS CASTINGS

GRAY IRON

Specification		Class	Tensile Min psi	Heat Treatment*	Properties & Typical Applications
ASTM A190-47 A.S.A. G27.1-1942		.. ..	....	2	Lightweight, thin section castings requiring good appearance, high machinability, close tolerances. Use where strength is not a prime requisite. Specific qualities usually established by sample.
ASTM A-48-56 A.S.A. G25.1-1948 ASME S61-1948 A.A.S.H.O. M105-49 C.S.A. S61-1948 Federal QQ-1-652a	All basically the same	20 25 30 35 40 45 50 60	20,000 25,000 30,000 35,000 40,000 45,000 50,000 60,000	2 1 1 1 	Same as above with minimum tensile requirement. Excellent machinability as annealed. Good mechanical properties with high machinability. Most commonly used grade for general machinery, valves, light compressor bodies, municipal castings, waterworks equipment. Machine tools, medium gear blanks, heavy compressors, motor blocks. Large castings for heavy service: Dies, hydraulic cylinders, machine tools, permanent molds, large gears, press frames.
ASTM A159-55 SAE spec. No. given in class column	Automotive castings	110 111 113 114 120 121 122	20,000 30,000 30,000 40,000 35,000 40,000 45,000	2 1 1 1 1 1 1	Miscellaneous soft iron castings in which strength & microstructure are not primary considerations. Small cylinder blocks, heads, pistons, clutch plates, oil pump bodies, gearboxes, clutch housings, lightweight brake drums. Brake drums & clutch plates for moderate service requirements where high-carbon iron is desired & heat checking is problem. Heavy duty drums & clutch plates where strength & resistance to heat checking are requirements. Automotive cylinder blocks, heads, flywheels, cylinder liners, pistons. Truck & tractor cylinder blocks, heads, heavy flywheels, tractor transmission cases, differential carriers. Diesel engine castings, liners, cylinders, pistons, heavy parts.
ASTM A278-56		40 50 60	40,000 50,000 60,000	3 3 3	Pressure containing parts for use up to 650° F. Valve bodies, paper mill dryer rolls, chemical process equipment.
ASTM A319-53		I II III	Low 30,000 about 40,000	2 2 2	Nonpressure containing parts for elevated temperature. Stoker & firebox parts, grate bars, process furnace parts, ingot molds. I: Superior resistance to thermal shock. II: Average resistance to thermal shock; moderate tensile strength. III: High creep & rupture strength.
U.S. Navy 46-1-9		..	25,000	..	High alloy scale resisting castings. For resistance to corrosion of acid, caustic & salt, including concentrated brine.
Mil-G-858A		I II	25,000 25,000	.. ..	High alloy for resistance to corrosion, scaling, warpage, growth; use at elevated temperatures. Galley range tops; to resist acid, caustic & salt.

Source: Gray Iron Founders' Society Inc.
*1. Hardenable by conventional, flame, or induction heat treatment. 2. Hardening not recommended. 3. Must be stress relief annealed.

NODULAR (Ductile or S. G.) IRON

Specification	Class or Grade	Tensile Min psi	Yield Min psi	Elong in 2 in. min %	Heat Treatment	Properties & Typical Applications
ASTM A339-55	80-60-03	80,000	60,000	3	.....	High strength in as-cast condition. Heavy duty machinery, gears, dies, rolls.
	60-45-10	60,000	45,000	10	Usually annealed	Toughness & machinability. Pressure castings, valves, pump bodies, compressor heads, shock resisting parts.
ASTM A395-55T	60-45-15	60,000	45,000	15	Ferritized by annealing	Pressure containing parts for use at elevated temperatures. Valves, fittings for steam.
Mil-1-17166A (ships)	60-40-15	60,000	40,000	15	Ferritized by annealing to 190 max Bhn	Navy shipboard & other uses requiring shock resistance. Motor frames, ends, engine blocks, heads, compressors, valves, clamps.
ASTM A396-55T	120-90-02 100-70-03	120,000 100,000	90,000 70,000	2 3	Heat treated	For high strength applications (obtained by heat treatment), pinions, gears, cams, guides, track rollers.
Mil-1-11466 (ordnance)	Class 1 Class 2 Class 3 Class 4	120,000 100,000 85,000 80,000	90,000 75,000 60,000 60,000	2 4 6 3	Usually quenched & tempered As-cast	Military equipment. (Unless otherwise specified, one metallographic test shall be made for each lot.)
	Class 5 Class 6	60,000 60,000	45,000 40,000	10 18	Ferritized by annealing	

Source: Gray Iron Founders' Society Inc.

MALLEABLE IRON

ASTM Spec. No.	ASTM No.	Tensile Min psi	Yield Min psi	Elong in 2 in. min %	Properties & Typical Applications
		STANDARD			
A-47	32510	50,000	32,500	10	Tough, impact & fatigue-resistant, easily machined, uniform structure. Castable in ⅛-in. minimum sections. Automobile, truck differential cases, carriers, steering gear housings, brackets, railroad car & track parts, agricultural implement parts, conveyer, & electrical fittings.
	35018	53,000	35,000	18	
		PEARLITIC			
A-220T	45010	65,000	45,000	10	High strength, hardness, resistance to abrasion, good machinability. Has castability & excellent surface finish of standard malleable. Hardenable to 50 to 60 Rc. Automotive valve rocker arms, automatic transmission parts, agricultural implement gears, sprockets, crankshafts, weapon parts, diesel electric power switch segment gears, armature & frame heads, gear cases, shifter forks.
	45007	68,000	45,000	7	
	48004	70,000	48,000	4	
	50007	75,000	50,000	7	
	53004	80,000	53,000	4	
	60003	80,000	60,000	3	
	80002	100,000	80,000	2	

Source: Malleable Founders' Society.

CAST STEEL—Carbon Structural Grades

Tensile Min psi	Yield Min psi	Specifications ASTM or SAE	C Range	Mn Range	Properties & Typical Applications
60,000 Min Elong 24%	30,000	A 27-55 U 60-30 60-30	0.10-0.20	0.50-1.00	Low electrical resistivity, excellent weldability. Can be carburized & case hardened. Electrical equipment gears, drums, railroad & furnace equipment.
65,000 Min Elong 24%	35,000	A 27-55 65-30, 65-35 SAE 0030	0.20-0.30	0.60-1.00	Excellent weldability, medium strength, good durability & machinability. Railroad, power shovel, rolling mill equipment, presses, gears, sprockets, machine frames, miscellaneous medium strength castings.
70,000 Min Elong 24%	38,000	A 27-55 70-36 A 216-53T WCB	0.25-0.35	0.60-1.00	
80,000 Min Elong 18%	40,000	SAE 080	0.50 max	1.00 max	High strength, toughness, good fatigue, wear resistance, high rigidity. Gears, rolls, blanking & forming dies, pinions, sprockets, machine tools, impellers, liners, castings requiring rigidity & hardness.
85,000 Min Elong 16%	45,000	SAE 0050	0.40-0.50	1.00 max	

CAST STEEL—Low Alloy Engineering Grades

Tensile Min psi	Yield Min psi	Specifications ASTM or SAE	Normalized & Tempered	Water Quenched & Tempered	Properties & Typical Applications
80,000 Min Elong 22%	50,000	A 148-55 80-40 80-50 SAE 090	1330 2317 4032 6120 Mn Mo* TS8130		Excellent weldability, medium strength with high toughness & good machinability; shock & abrasion resistance. Pneumatic tools, railroad equipment, pressure parts, automotive parts, track wheels, tractor treads, gears, sprockets.
90,000 Min Elong 20%	60,000	A 148-55 90-60 SAE 090	1335 3130 4137 4630 6130 Mn Mo* Mn V**	1330 4028 5135	Offers a variety of strengths & hardenabilities, depending on alloy content. Good fatigue properties.
100,000 Min Elong 17%	65,000		3135 4140 4330 4635 6130 Mn Mo* TS8630 8630 4032 TS8130	4032 TS8130 Mn Mo*	Normalized & Tempered: Oil well tools, sheaves, sprockets, locomotive parts, gears, cams, earth-moving equipment, highly stressed castings. Quenched & Tempered: Hardened castings, gears, cams, rollers, abrasion resistant castings, bucket teeth, small crusher jaws, conveyer chain links, dredge pumps, impellers, valve liners, oil field tongs. Good impact properties.
110,000 Min Elong 17%	85,000	A 148-55 105-85 SAE 0105	4140 4335 9530	3130 4130 4030 4630 Mn Mo*	High resistance to impact, excellent strength & toughness.
120,000 Min Elong 14%	95,000	A 148-55 120-95 SAE 0120	4340	3135 6130 Mn Mo* TS8630 8630 9530 4340	Normalized & Tempered: Excellent air hardening properties. Abrasion resistant applications, dredge pumps, gears, dies, rolling mill equipment, molybdenum-bearing castings for shock valves, flanges, turbine casings, hydroelectric equipment. Quenched & Tempered: Good low temperature impact toughness, excellent abrasion resistance, deep hardening.
150,000 Min Elong 9%	125,000	A 148-55 150-125 SAE 0150		4330 9530	Deep hardening, high strength, & high wear resistance.
175,000 200,000	Custom steels for special engineered products.				*Mn Mo = C 0.25-0.35, Mn 1.25-1.75; Mo 0.15-0.25. **Mn V = C 0.25-0.35, Mn 1.25-1.75, V 0.10-0.15.

CAST STEEL—High & Low Temperature Service

Tension Min psi	Yield Min psi	Specifications ASTM or SAE	Bend & Impact Properties	Properties & Typical Applications
60,000	30,000	A 216-53T WCA	90 degree bend*	A 216-53T carbon steels exhibit good weldability & good creep resistance at relatively high temperatures. Pressure containing castings for medium high temperature service.
70,000 Min Elong 22%	40,000	A 216-53T WCB A 217-55 WC1, WC4 WC5, WC6, WC9	90 degree bend	A 217-53T steels are alloyed to give good creep resistance & high temperature properties. Pressure containing castings for high temperature service.
90,000 Min Elong 18%	60,000	A 217-55 C5, C12	90 degree bend	
70,000 Min Elong 24%	40,000	A 352-55T LCB LC1 LC2, LC3	15 ft-lb**	Ferritic steels with good notch ductility at temperatures from −50° F to −150° F. Test temperatures for each grade: −50° F, LCB; −75° F, LC1; −100° F, LC2; −150° F, LC3. Pressure containing castings for service at low temperatures.

*Expected value only, no test required unless specified.
**Charpy keyhole notch impact test required at temperatures specified by customer.

Source: Steel Founders' Society of America.

ALUMINUM Casting Alloys

Alloy	Composition Limits % max or range; Al remainder	Properties & Uses by Casting Type
12 (112 or 113) ASTM CS72A SAE 33	Cu 6.0-8.0; Fe 1.4; Si 1.0-4.0; Mn 0.6; Mg 0.10; Zn 2.5; Ti 0.25; Ni 0.35; others 0.50	Fair castability & good machinability. Early general purpose alloy. *Permanent Mold:* Vacuum cleaner housings, general purpose castings. *Sand:* Transmission housings, cover plates, manifolds, & miscellaneous machined castings.
13 ASTM S12A SAE 305	Cu 0.6; Fe 1.3; Si 11.0-13.0; Mn 0.35; Mg 0.10; Zn 0.35; Ni 0.50; Sn 0.15; others 0.25	Excellent castability with good corrosion resistance. Good mechanical properties. General purpose alloy for large intricate parts with thin sections. *Die:* Typewriter frames, outboard motor pistons, dental equipment, instrument cases.
Apex Z33	Cu 2.5-3.5; Si 4.5-5.5; Mg 0.10; Zn 2.5-3.5; Fe 1.0; Mn 0.50; others 0.50	Good machinability, fair castability. Takes high polish. Similar to Z30. *Sand:* Household appliances, automotive, & miscellaneous machined parts.
Apex Z39	Cu 3.5-4.5; Si 8.5-9.5; Mg 0.1; Zn 1.5-2.5; Fe 1.2; Mn 0.5; Ni 0.5; others 0.4 each	Good castability & excellent machinability. *Die:* Automatic transmission impellers & housings, toys, brackets & other castings where machining is required.

Aluminum Casting Alloys (continued)

Alloy	Composition Limits % max or range; Al remainder	Properties & Uses by Casting Type
43 ASTM S5A SAE 35, 304	Cu 0.15; Fe 0.8; Si 4.5-6.0; Mn 0.35; Mg 0.05; Zn 0.35; Ti 0.25; others 0.05 each	Excellent castability & pressure tightness, good weldability & ductility, good corrosion resistance. *Permanent Mold:* Carburetor bodies, refrigerator shelf brackets & fittings, cooking utensils. *Sand:* Architectural & ornamental parts, pipe fittings, cooking utensils, food handling equipment & marine fittings. *Die:* Cookware, marine fittings.
Apex Z50	Cu 4.0-5.0; Si 2.5-3.5; Mg 0.07; Zn 1.5-2.5; Fe 1.0; Mg 0.6; Ni 0.3	Good machinability, fair castability. Takes high polish. *Sand:* Household appliances, automotive, & miscellaneous machined parts.
108 ASTM CS43A Apex 50	Cu 3.5-4.5; Fe 1.2; Si 2.5-3.5; Mn 0.50; Mg 0.10; Zn 1.0; Ti 0.25; Ni 0.35; others 0.50	General purpose alloy with fair castability. *Sand:* Manifolds, valve bodies, & similar castings.
A132 ASTM SN122A SAE 321	Cu 0.50-1.5; Fe 1.3; Si 11.0-13.0; Mn 0.35; Mg 0.7-1.3; Zn 0.35; Ti 0.25; Ni 2.0-3.0; others 0.05	Good high-temperature properties at 500 to 600° F. Low coefficient of thermal expansion. Weldability good. *Permanent Mold:* Pulleys & sheaves, automotive & diesel pistons.
F132 ASTM SC103A SAE 332	Cu 2.0-4.0; Fe 1.2; Si 8.5-10.5; Mn 0.50; Mg 0.5-1.5; Zn 1.0; Ni 0.50; Ti 0.25; others 0.5	Similar to A132 but with better castability & machinability.
138 ASTM CS104A	Cu 9.0-11.0; Fe 1.5; Si 3.5-4.5; Mn 0.6; Mg 0.15-0.35; Zn 1.5; Ti 0.25; Ni 1.0; others 0.50	High as-cast hardness; good castability & good machinability. *Permanent Mold:* Sole plates for electric hand irons.
142 (Y-alloy) ASTM CN42A SAE 39 A142	Cu 3.5-4.5; Fe 1.0; Si 0.7; Mn 0.35; Mg 1.2-1.8; Zn 0.35; Cr 0.25; Ti 0.25; Ni 1.7-2.3; others 0.15	Good strength at elevated temperatures. *Permanent Mold:* Aircraft generator housings, diesel & aircraft pistons, air cooled cylinder heads. *Sand:* Diesel engine pistons & air cooled cylinder heads. A142 has optimum high temperature properties.
Apex Red X 8 ASTM SC82A SAE 327	Cu 1.0-2.0; Si 7.0-8.5; Mg 0.2-0.6; Zn 1.0; Cr 0.3; Fe 1.0; Mn 0.2-0.6; others 0.2 each	Castability & mechanical properties good. Rugged, tough alloy for extreme applications. *Sand:* Cylinder blocks, crankcases, supercharger housings & general automotive use.
Apex Red X 11	Cu 1.0-2.0; Si 10.5-11.8; Mg 0.4-1.0; Zn 1.0; Fe 0.9; Mn 0.5-0.9; others 0.2 each	Good castability with low coefficient of expansion. *Permanent Mold:* Automotive pistons & similar applications.
152 Apex 66 ASTM CS66A SAE 300	Cu 5.5-7.5; Fe 1.5; Si 5.0-6.0; Mn 0.8; Mg 0.20-0.6; Zn 0.8; Ti 0.25; others 0.8	Good elevated temperature strength & good machinability. *Permanent Mold:* Automotive pistons.
195 ASTM C4A SAE 38	Cu 4.0-5.0; Fe 1.0; Si 1.5; Mn 0.35; Mg 0.03; Zn 0.35; Ti 0.25; others 0.15	Castability poor with good machining properties. Good balance of mechanical properties for parts needing strength & ruggedness. *Sand:* Flywheel & rear axle housings, bus & aircraft wheels, spring hangers, fittings, crankcases; usually heat treated.
214 ASTM G4A SAE 320	Cu 0.15; Fe 0.50; Si 0.35; Mn 0.35; Mg 3.5-4.5; Zn 0.15; Ti 0.25; others 0.15	Castability poor; good balance of mechanical properties. Excellent corrosion & tarnish resistance. Good alloy for anodizing. *Sand:* Dairy & food handling equipment, cooking utensils, fittings for chemical & sewage use, hardware & ornamental housings.
218 ASTM G8A	Cu 0.25; Fe 1.8; Si 0.35; Mn 0.35; Mg 7.5-8.5; Zn 0.15; Ni 0.15; Sn 0.15; others 0.25	Good resistance to corrosion & tarnish. Excellent strength & ductility. Good for anodizing. *Die:* Parts requiring high strength, ductility & corrosion resistance, such as aircraft brake shoes & fittings, conveyer units, hardware. Not best for intricate parts due to poor castability.
220 ASTM G10A SAE 324	Cu 0.25; Fe 0.30; Si 0.25; Mn 0.15; Mg 9.5-10.6; Zn 0.15; Ti 0.25; others 0.15	Requires special foundry practice. Highest strength & elongation of any sand casting alloy when heat treated. Good machinability & corrosion resistance. *Sand:* Parts requiring strength & shock resistance: Aircraft fittings, levers, brackets. Not for use above 250° F.
319 ASTM SC64C SAE 329	Cu 3.0-4.5; Fe 1.2; Si 5.5-7.0; Mn 0.8; Mg 0.50; Zn 1.0; Ti 0.25; Ni 0.50; others 0.50	Excellent castability with good mechanical properties. *Sand:* Piano plates & frames, engine crankcases, oil pans, rear-axle housings, requiring leak tightness, general purpose uses.
A319 Apex Allcast 70 ASTM SC64B SAE 326	Cu 3.3-4.3; Fe 1.0; Si 5.5-7.0; Mn 0.50; Mg 0.10; Zn 1.0; Ti 0.25; Ni 0.35; others 0.50	Excellent castability, good mechanical properties. Pressure tightness exceptional. *Sand:* Engine crankcases, oil pans, automatic transmission housings. *Permanent Mold:* Typewriter frames, engine parts.
355 (A-355) C355 (HP355) ASTM SC51A SAE 322	Cu 1.0-1.5; Fe 0.6; Si 4.5-5.5; Mn 0.50; Mg 0.45-0.60; Zn 0.35; Cr 0.25; Ti 0.25; others 0.15	Castability & weldability good. Pressure tightness good. Parts usually heat treated. *Permanent Mold:* Aircraft supercharger covers, impellers, fittings & timing gears. Meter parts & fuel pump bodies. *Sand:* Air compressor pistons, printing press bed plates, crankcases, water jackets, gear housings, electric motor fans & blowers. Very widely used. C355 & HP355 for higher strength & ductility.
356 A356 (HP356) ASTM SG70A SAE 323	Cu 0.25; Fe 0.60; Si 6.5-7.5; Mn 0.35; Mg 0.20-0.40; Zn 0.35; Ti 0.25; others 0.15	Castability & weldability good. Good pressure tightness & resistance to corrosion. Parts usually heat treated. *Permanent Mold:* Machine tool parts, handwheels, aircraft pump parts. *Sand:* Automotive transmission cases, flywheel housings, oil pans, rear axle housings, brackets, fittings, & pump bodies. A356 & HP356 for higher strength & ductility.
Apex Ternalloy 5 ASTM ZG32A SAE 311	Cu 0.20; Si 0.20; Mg 1.4-1.8; Zn 2.7-3.3; Cr 0.20-0.40; Fe 0.8; Mn 0.4-0.6; Ti 0.25; others 0.05 each	High strength & good elongation without heat treatment. Exceptional dimensional stability. Good brazing & welding alloy. *Sand:* Pipe fittings, wrenches, farm machinery, machine tool equipment, high pressure valves, & other high strength uses. *Permanent Mold:* Street lighting equipment, heavy-duty brackets, tooling equipment, precision gages, castings for electronics.
Apex Ternalloy 7 ASTM ZG42A SAE 312	Cu 0.20; Si 0.20; Mg 1.8-2.4; Zn 4.0-4.5; Fe 0.8; Mn 0.40-0.6; Cr 0.20-0.40; Ti 0.25; others 0.05 each	Same as above but for parts needing less elongation & higher yield strength. *Sand & Permanent Mold:* Can be heat treated to high strength.
360 ASTM SG100A SAE 309	Cu 0.6; Fe 1.3; Si 9.0-10.0; Mn 0.35; Mg 0.40-0.6; Zn 0.50; Ni 0.50; Sn 0.15; others 0.25	Excellent castability. Mechanical properties & corrosion resistance good. *Die:* Cover plates, instrument cases, general purpose castings.
380 ASTM SC84A Apex 39 SAE 306	Cu 3.0-4.0; Fe 1.3; Si 7.5-9.5; Mn 0.50; Mg 0.10; Zn 1.0; Ni 0.50; Sn 0.35; others 0.50	Castability & mechanical properties good. Good machinability. *Die:* General purpose parts. Most widely used diecasting alloy.
384 ASTM SC114A SAE 303	Cu 3.0-4.5; Fe 1.3; Si 10.5-12.0; Mn 0.50; Mg 0.10; Zn 1.0	Excellent for thin walls. *Die:* Wringer frames, toys, automatic transmissions, general purpose thin wall castings.
Apex 417 Almag ASTM GM70B	Cu 0.10; Si 0.20; Mg 6.2-7.5; Fe 0.25; Mn 0.10-0.25; Ti 0.10-0.25; others 0.05 each	High strength, exceptional ductility; good anodizing characteristics, & machinability: *Sand:* C-clamps, brackets & machined parts requiring strength, machinability, corrosion resistance, polishing, & anodizing. *Permanent Mold:* Impellers, optical equipment needing high polish or anodized finish.
A612 ASTM ZG61B SAE 313	Cu 0.35-0.65; Fe 0.50; Si 0.15; Mn 0.05; Mg 0.6-0.8; Zn 6.0-7.0; Ti 0.25; others 0.15	High strength & ductility without heat treatment. Good machinability. *Sand:* General purpose castings, particularly for brazing.
C612 ASTM ZC60A SAE 314	Cu 0.35-0.65; Fe 1.4; Si 0.35; Mn 0.05; Mg 0.25-0.45; Zn 6.0-7.0; Ti 0.25; others 0.15	High strength & ductility without heat treatment. Good machinability. *Permanent Mold:* Torque converter impeller blades & furniture parts requiring brazing.
Federated Tenzaloy ASTM ZC81A-B	Cu 0.40-1.0; Fe 1.0; Si 0.25; Mn 0.6; Mg 0.20-0.50; Zn 7.0-8.0; Cr 0.35; Ti 0.25; Ni 0.15; others 0.25	High strength without heat treatment. Ages at room temperature to give properties of heat treated castings. *Permanent Mold:* Machine tool frames, high-speed fan rotors. *Sand:* Housings for hoists & other heavy duty equipment. Street signs & brackets. Excellent machinability, easily brazed.
40E ASTM ZG61A SAE 310	Cu 0.30; Fe 1.0; Si 0.25; Mn 0.30; Mg 0.50-0.65; Zn 5.2-6.0; Cr 0.40-0.60; Ti 0.10-0.25; others 0.25	Good mechanical properties without heat treatment. Good resistance to corrosion & shock. *Sand:* Aircraft & instrument parts subject to shock.
750	Cu 0.7-1.3; Fe 0.7; Si 0.7; Mn 0.10; Ni 0.7-1.3; Ti 0.20; Sn 5.5-7.0; others 0.30	Good bearing qualities with good compressive strength. *Permanent Mold & Sand:* Bearings, bushings, & parts needing bearing properties.

ALUMINUM Wrought Alloys

Alloy Designation Al Assn.	Old Com.	Chemical Composition % max or range. Al remainder	Commercial Forms*	Properties & Applications
EC	EC	Al 99.45 min	S,W,B,E,T	Electrical conductors.
1060	BD1S	Si 0.25; Fe 0.35; Cu 0.05; Mn 0.03; Mg 0.03; Zn 0.05; Ti 0.03; others 0.03 each; total 0.15	S,T	Chemical equipment & railroad tank cars.
1100	2S	Si & Fe 1.0; Cu 0.20; Mn 0.05; Zn 0.10	S,W B,E,T,F	Sheet metal work, spun hollow ware, & decorative parts. Good formability. Impact extrusions†.
1145	BE1S	Si & Fe 0.55; Cu 0.05; Mn 0.05; others 0.03 each; Al 99.45 min	Foil	Used in manufacture of foil.
2011	11S	Si 0.40; Fe 0.7; Cu 5.0-6.0; Zn 0.30; Pb 0.20-0.6; Bi 0.20-0.6	W,B,E	Screw machine products.
2014	14S R301	Si 0.50-1.2; Fe 1.0; Cu 3.9-5.0; Mn 0.40-1.2; Mg 0.20-0.8; Cr 0.10; Zn 0.25; Ti 0.15	S,W,B,E,T,F	Heavy-duty structures, aircraft, & truck frames. High strength with good machinability.
Alclad 2014		(same as above)	S	Corrosion resistance is better than 2014.
2017	17S	Si 0.8; Fe 1.0; Cu 3.5-4.5; Mn 0.40-1.0; Mg 0.20-0.8; Cr 0.10; Zn 0.25	W,B	Screw machine products. Higher strength than 2011.
2018	18S	Si 0.9; Fe 1.0; Cu 3.5-4.5; Mn 0.20; Mg 0.45-0.9; Cr 0.10; Ni 1.7-2.3; Zn 0.25	F	Aircraft engine cylinder heads & pistons. High strength with good machinability.
2024	24S	Si 0.50; Fe 0.50; Cu 3.8-4.9; Mn 0.30-0.9; Mg 1.2-1.8; Cr 0.10; Zn 0.25	S,W,B E,T	Aircraft structures, truck wheels, screw machine products. High strength & hardness.
Alclad 2024		(same as above)	S	Same as 2024 with greater corrosion resistance.
2025	25S	Si 0.50-1.2; Fe 1.0; Cu 3.9-5.0; Mn 0.40-1.2; Mg 0.05; Cr 0.10; Zn 0.25; Ti 0.15	F	Propeller blades & other high strength forgings.
2117	A17S	Si 0.8; Fe 1.0; Cu 2.2-3.0; Mn 0.20; Mg 0.20-0.50; Cr 0.10; Zn 0.25	W,B	Cold heading wire & rivets.
2218	B18S	Si 0.9; Fe 1.0; Cu 3.5-4.5; Mn 0.20; Mg 1.2-1.8; Cr 0.10; Ni 1.7-2.3; Zn 0.25	F,W	Aircraft engine cylinder heads & pistons, jet engine impellers & compressor rings.
3003	3S	Si 0.6; Fe 0.7; Cu 0.20; Mn 1.0-1.5; Zn 0.10	S,W,B,E,T,F	Cooking utensils, pressure vessels, tanks, piping, architectural uses, builders' hardware.
Alclad 3003		(same as above)	S,T	Tea kettles, chemical equipment, heat exchange tubes, pressure vessels, storage tanks, flashing.
3004	4S	Si 0.30; Fe 0.7; Cu 0.25; Mn 1.0-1.5; Mg 0.8-1.3; Zn 0.25	S	Special sheet metal work, shoe eyelets, pressure vessels, storage tanks.
Alclad 3004		(same as above)	S	Industrial building sheets & flashing.
4032	32S	Si 11.0-13.5; Fe 1.0; Cu 0.50-1.3; Mg 0.8-1.3; Cr 0.10; Ni 0.50-1.3; Zn 0.25	F,W	Pistons, forging stock.
4043	43S K145	Si 4.5-6.0; Fe 0.8; Cu 0.30; Mn 0.05; Mg 0.05; Zn 0.10; Ti 0.20	W,E,T	Intermediate strength welding wire. Cladding on brazing sheet. Architectural applications.
5005	A50S, R305, K155	Si 0.40; Fe 0.7; Cu 0.20; Mn 0.20; Mg 0.50-1.1; Cr 0.10; Zn 0.25	S	Refrigerator uses, architectural & auto trim.
5050	50S	Si 0.40; Fe 0.7; Cu 0.20; Mn 0.10; Mg 1.0-1.8; Cr 0.10; Zn 0.25	S,W,B,T	Decorative refrigerator parts, builders' hardware, coiled tubes; architectural, auto trim.
Alclad 5050		(same as above)	S	Better corrosion resistance than 5050.
5052	52S	Si & Fe 0.45; Cu 0.10; Mn 0.10; Mg 2.2-2.8; Cr 0.15-0.35; Zn 0.10	S,W,B,T	Sheet metal work; appliances; bus, truck, & marine uses; hydraulic tubes; clock plates & parts. Workability & weldability good.
5056	56S	Si 0.30; Fe 0.40; Cu 0.10; Mn 0.05-0.20; Mg 4.5-5.6; Cr 0.05-0.20; Zn 0.10	S,W,E	High strength aluminum wire, rivets, staple wire, zippers.
Alclad 5056		(Same as above)	W	Insect screen cloth.
5083	LK183	Si 0.40; Fe 0.40; Cu 0.10; Mn 0.50-1.0; Mg 4.0-4.9; Cr 0.25; Zn 0.25; Ti 0.15	E, plate	High strength welded structures, tanks, marine use, heavy structures.
5086	K186	Si 0.40; Fe 0.50; Cu 0.10; Mn 0.20-0.7; Mg 3.5-4.5; Cr 0.25; Zn 0.25	S	Structural alloy with good weldability. Trailer tanks, unfired pressure vessels, towers, elevator cars & truck frames, marine applications.
5154	A54S	Si & Fe 0.45; Cu 0.10; Mn 0.10; Mg 3.1-3.9; Cr 0.15-0.35; Zn 0.20; Ti 0.20	S,W,B	Pressure vessels, marine use. High strength welding wire.
5155	....	Si 0.30; Fe 0.7; Cu 0.25; Mn 0.20-0.6; Mg 3.5-5.0; Cr 0.05-0.25; Zn 0.25; Ti 0.15	S	Trailer tanks, unfired pressure vessels, towers, elevator cars & truck frames, marine applications.
5183	....	Same as 5083, except 4.3-5.2 Mg	W	Welding wire for 5083 plates & extrusions.
5356	C56S	Si & Fe 0.50; Cu 0.10; Mn 0.05-0.20; Mg 4.5-5.5; Cr 0.05-0.20; Zn 0.10; Ti 0.06-0.20	W	Welding wire.
5357	C57S K157	Si 0.12; Fe 0.17; Cu 0.07; Mn 0.15-0.45; Mg 0.8-1.2	S	Refrigerator parts, builders' hardware.
X5454	....	Mn 0.8; Mg 2.75; Cr 0.10 (Nominal)	S,E	Strong welded structures which operate at slightly elevated temperatures. Tanks, tubes, pipes.
5456	....	Si & Fe 0.40; Cu 0.05-0.20; Mn 0.50-1.0; Mg 4.7-5.5; Cr 0.05-0.20; Zn 0.25; Ti 0.10; Be 0.0005	W,E, plate	Uses same as 5083; available as welding filler wire.
6053	53S	Si 45-65% of Mg; Fe 0.35; Cu 0.10; Mg 1.1-1.4; Cr 0.15-0.35; Zn 0.10	W	Rivet wire & rivets.
6061	61S	Si 0.40-0.8; Fe 0.7; Cu 0.15-0.40; Mn 0.15; Mg 0.8-1.2; Cr 0.15-0.35; Zn 0.25; Ti 0.15	S,W,B,E,T,F	Heavy-duty structures where corrosion resistance is needed. Bridge railings, marine uses, furniture.
Alclad 6061		(same as above)	S	Better corrosion resistance & appearance.
6062	62S	Si 0.40-0.8; Fe 0.7; Cu 0.15-0.40; Mn 0.15; Mg 0.8-1.2; Cr 0.04-0.14; Zn 0.25; Ti 0.15	E,T	Alternate for 6061; preferred for extrusions & tubing
6063	63S	Si 0.20-0.6; Fe 0.35; Cu 0.10; Mn 0.10; Mg 0.45-0.9; Cr 0.10; Zn 0.10; Ti 0.10	E,T	Pipe, railings, builders' hardware, windows, architectural uses, truck & trailer flooring.
6066	66S	Si 0.9-1.8; Fe 0.50; Cu 0.7-1.2; Mn 0.6-1.1; Mg 0.8-1.4; Cr 0.40; Ti 0.20	W,B,E,T,F	Trailer & aircraft structures. Strength & corrosion resistance between 6061 and 2024.
6101	....	Si 0.30-0.7; Fe 0.50; Cu 0.10; Mg 0.35-0.8; Cr 0.03; Zn 0.10; B 0.06 max; others 0.03 each	W,B,T	High strength electrical conductor.
6151	A51S	Si 0.6-1.2; Fe 1.0; Cu 0.35; Mn 0.20; Mg 0.45-0.8; Cr 0.15-0.35; Zn 0.25; Ti 0.15	F,W	Intricate forgings for machine & automotive parts.
X6463	....	Si 0.20-0.6; Fe 0.15; Cu 0.20; Mn 0.05; Mg 0.45-0.90	E	High finish extrusion alloy for automotive & architectural use; gives bright anodized finish.
6951	J51S K160	Si 0.20-0.50; Fe 0.8; Cu 0.15-0.40; Mn 0.10; Mg 0.40-0.8; Zn 0.20	S,W,B,E,T	Heat exchangers & cooling systems.
7001	HZM100	Si 0.35; Fe 0.40; Cu 1.6-2.6; Mn 0.20; Mg 2.6-3.4; Cr 0.18-0.40; Zn 6.8-8.0; Ti 0.20	E,F	High strength alloy for aircraft structures.
7072	72S	Si & Fe 0.7; Cu 0.10; Mn 0.10; Mg 0.10; Zn 0.8-1.3	W	Metallizing wire for sprayed, corrosion-resistant coatings. Cladding alloy.
7075	75S	Si 0.50; Fe 0.7; Cu 1.2-2.0; Mn 0.30; Mg 2.1-2.9; Cr 0.18-0.40; Zn 5.1-6.1; Ti 0.20	S,W,B,E,F,T	Aircraft structures & keys. High strength alloy.
Alclad 7075		(same as above)	S	Improved corrosion resistance over 7075.
7076	76S	Si 0.40; Fe 0.6; Cu 0.30-1.0; Mn 0.30-0.8; Mg 1.2-2.0; Zn 7.0-8.0; Ti 0.20	F	Forgings, propeller blades.
7079	X79S	Si 0.30; Fe 0.40; Cu 0.40-0.8; Mn 0.10-0.30; Mg 2.9-3.7; Cr 0.10-0.25; Zn 3.8-4.8; Ti 0.10	F,E, plate	Similar to 7075; preferred for heavy sections.
7178	XA78S	Si 0.50; Fe 0.7; Cu 1.6-2.4; Mn 0.30; Mg 2.4-3.1; Cr 0.18-0.40; Zn 6.3-7.3; Ti 0.20	S,E,W,B	Very high strength structural alloy; aircraft applications.
Alclad 7178		(same as above)	S	Increased corrosion resistance over 7178.
7277	B77S	Si 0.50; Fe 0.7; Cu 0.8-1.7; Mg 1.7-2.3; Cr 0.18-0.35; Zn 3.7-4.3; Ti 0.10	Rivets & rivet rod	Large rivets that are hot driven. High strength applications.

Note: Other metals allowed for each alloy: Each 0.05; total 0.15, except where noted.

*Abbreviations: S—Flat-rolled products, sheets, strip & plates.
W—Wire, rods. B—Bars. F—Forgings.
E—Extrusions. T—Tubes & pipe.

†Other alloys for impact extrusions: 2014, 2018, 2218, 3003, 4032, 5052, 6061, 6062, 6063, 6066, 7001, 7075, 7079.

COPPER Casting Alloys

Alloy & Nominal Composition	Machinability[1]	Properties & Applications
ASTM specification B143		
1A—Tin bronze (Cu 88; Sn 10; Zn 2; P 0.35 opt.)	50	Bearings & bushings, fasteners, valve bodies for temperatures to 550° F, steam pressure castings, oil pumps, carburetors, gears.
1B—Tin bronze (Cu 88; Sn 8; Zn4)	50	
2A—Leaded tin bronze (Cu 88; Sn 6; Pb 2; Zn 4)	60	
2B—Leaded tin bronze (Cu 87; Sn 8; Pb 1; Zn 4)	60	
ASTM specification B144		
3A—High-leaded, tin bronze (Cu 80; Sn 10; Pb 10; Ni 0.75 max)	80	Bearing bronzes. Acid resisting. Those with highest copper content for heaviest loads. Bearings, shoes, wedges, bushings & uses where an antifriction, soft material is needed.
3B—High-leaded, tin bronze (Cu 83; Sn 7; Pb 7; Zn 3; Ni 0.50 max)	70	
3C—High-leaded, tin bronze (Cu 85; Sn 5; Pb 9; Zn 1; Ni 0.50 max)	70	
3D—High-leaded, tin bronze (Cu 78; Sn 7; Pb 15; Ni 0.75 max)	80	
3E—High-leaded, tin bronze (Cu 70; Sn 5; Pb 25; Ni 0.75 max)	90	
ASTM specification B145		
4A—Leaded red brass (Cu 85; Sn 5; Pb 5; Zn 5)	90	General purpose, moderate strength castings. Superior machinability. Plumbing goods, pumps, hardware, ornamental objects, low pressure valves. Air, gas, oil & water fittings.
4B—Leaded red brass (Cu 83; Sn 4; Pb 6; Zn 7)	90	
5A—Leaded semi-red brass (Cu 81; Sn 3; Pb 7; Zn 9)	90	
5B—Leaded semi-red brass (Cu 76; Sn 3; Pb 6; Zn 15)	90	
ASTM specification B146		
6A—Leaded yellow brass (Cu 71; Sn 1; Pb 3; Zn 25)	80	Same type uses as red brasses. More difficult to cast, but sometimes preferred for color. Ferrules, andirons, furniture hardware, ship trimming.
6B—Leaded yellow brass (Cu 67; Sn 1; Pb 3; Zn 29)	80	
ASTM specification B147		
7A—Leaded, high-strength yellow brass (Cu 61; Sn 0.75; Pb 0.75; Zn 35.5; Fe 1; Al 0.75; Mn 0.25)	60	Used where strength & toughness are required. Heavy duty valve stems, gears, cams, bearings, hydraulic cylinder parts, marine fittings, lever arms, pump bodies, gas engine bases, brackets, screw-down nuts, hydraulic cylinder parts.
8A—High-strength yellow brass (Cu 58; Zn 40; Fe 1.25; Al 1.25; Mn 0.25)	30	
8B—High-strength manganese bronze (Varies to meet requirements)	30	
8C—High-strength manganese bronze (Varies to meet requirements)	20	
ASTM specification B148		
9A—Aluminum bronze (Cu 88; Fe 3; Al 9)	20	Strong, corrosion-resistant alloys. Good high heat strength. 9B, C & D are heat treatable. Gears, bushings, bearings, propellers, pickling baskets, valve seats, marine equipment, worms, heavy-duty feed nuts.
9B—Aluminum bronze (Cu 89; Fe 1; Al 10)	35	
9C—Aluminum bronze (Cu 85; Fe 4; Al 11)	20	
9D—Aluminum bronze (Cu 81; Fe 4; Ni 4; Al 11)	20	
ASTM specification B149		
10A—Leaded nickel brass (Cu 57; Sn 2; Pb 9; Zn 20; Ni 12)	70	Sometimes called nickel silvers. Corrosion resistant hardware, plumbing fixtures, ornamental castings, dairy & soda fountain equipment, musical instruments, boat & railroad car fittings, trim.
11A—Leaded nickel bronze (Cu 64; Sn 4; Pb 4; Zn 8; Ni 20)	..	
11B—Nickel leaded bronze (Cu 66.5; Sn 5; Pb 1.5; Zn 2; Ni 25)	..	
ASTM specification B198		
12A—Silicon bronze (Sn 1 max; Pb 0.5 max; Zn 5 max; Fe 2.5 max; Ni 1.5 max; Al 1.5 max; Si 1-5; Cu rem)		Valve parts for corrosive conditions; good corrosion resistance in absence of oxygen. Naval parts, chemical parts, brackets, pole line hardware.
13A—Silicon brass (Pb 1 max; Zn 12-16; Si 2.5-4; Cu rem)		
13B—Silicon brass (Pb 0.5 max; Zn 12-16; Si 3-5; Cu rem)		
No ASTM specification		
Silicon-aluminum bronze (Cu 91; Al 7; Si 2)	50	Corrosion resistant. Higher strength than silicon brasses; valves, radar parts, pressure castings.
Silicon-aluminum bronze (Cu 90; Al 7; Si 3)	50	
Beryllium bronze (Cu 96.5; Ni 1.1; Be 2.2-2.8)	20-40	Heat treatable. Welding tips, nonsparking tools.

1. Basis: Free cutting brass=100.

MAGNESIUM

	Alloys ASTM No.	Nominal Composition (magnesium is rem.)	Properties
SAND & PERMANENT MOLD CASTINGS	AZ92A	Al 9.0; Mn 0.15; Zn 2.0; Cu 0.20 max	Excellent strength; good pressure tightness. Used in heat treated & aged condition for maximum strength.
	AZ63A	Al 6.0; Mn 0.25; Zn 3.0; Cu 0.20 max	Excellent strength; good pressure tightness. Used in heat treated & aged condition for maximum yield strength.
	EK30A	R.E. 3.0; Zr 0.35	For elevated temperatures (350-500° F). Good pressure tightness. Used in aged condition.
	EZ33A	R.E. 3.0; Zn 2.7; Zr 0.7	For use at elevated temperatures (350-500° F). Good pressure tightness.
	EK41A	R.E. 4.0; Zr 0.6	Similar to EZ33A but used in aged & heat treated & aged conditions.
	ZE41A	Zn 4.0; R.E. 1.0	Similar to EZ33A but has better creep strength.
	HZ32A	Zn 2.1; Th 3.0; Zr 0.7	For elevated temperatures (650-700° F); good pressure tightness. Used mostly in aged condition.
	HK31A	Th 3.0; Zr 0.7	Similar to HZ32A but used in heat treated & aged condition. Highest short time tensile properties of elevated temperature alloys.
	AZ81A	Al 8.0; Zn 1.0	Used where maximum ductility is required & a yield comparable to AZ63-T4 is acceptable.
	ZH62A	Zn 6.0; Th 2.0; Zr 0.7	High ductility & high yield strength in aged condition. Good creep properties to 350° F.
	ZK51A	Zn 5.0; Zr 0.7	Similar to ZH62A.
	AM100A	Al 10.0; Mn 0.10 min	Similar to AZ92A. Used primarily in heat treated & aged condition (-T61).
	AZ91C	Al 9.0; Zn 0.7	Excellent strength, pressure tightness. Used for more impact strength & elongation than AZ92A.
DIE-CAST	AZ91A	Al 9.0; Zn 0.6; Mn 0.20; Cu 0.08	Specification grade. Parts have good strength & ductility. Good castability.
	AZ91B	Al 9.0; Zn 0.6; Mn 0.20; Cu 0.25	Standard grade. Parts have good strength & ductility. Good castability.
FORGINGS & EXTRUSIONS	AZ80A	Al 8.0; Zn 0.6	For applications where high strength & ductility are not required.
	ZK60A	Zn 5.7; Zr 0.55	Highest strength. Used mostly in aged condition. Good toughness.
	AZ31B	Al 3.0; Zn 1.0	Most commonly used extrusion alloy. Good formability & weldability. Compatible to AZ31B sheets. Little used for forging at present; properties lower than AZ61A.
	AZ61A	Al 6.5; Zn 1.0	Improved strength over AZ31B, but not as formable.
	ZK60A	Zn 5.7; Zr 0.55	High strength; used mostly in aged condition. Good toughness.
	M1A	Mn 1.2	Used where stress relief after welding is not possible & strength requirements not severe.
	ZK60 XB-B	Zn 5.7; Zr 0.55	Higher strength than ZK60A. Extrusions made from pellets rather than billets.
	HM31XA	Th 3.0; Mn 1.0	Best elevated temperature properties of extrusion alloys. Good weldability to other elevated temperature alloys.
	A3XA	Al 3.0	Low neutron absorbtivity. Rapid decay of induced radioactivity.
SHEETS & PLATES	AZ31B	Al 3.0; Zn 1.0	Most commonly used sheet alloy. Good formability & weldability. Tooling plate. Compatible with AZ31B extrusions.
	HK31A	Th 3.0; Zr 0.70	Sheet alloy for elevated temperatures (700-800° F). Good formability & weldability.
	HM21XA	Th 2.0; Mn 1.0	Better properties at 700 to 800° F than HK31A. Best high temperature alloy to date.
	A3XA	Al 3.0	Low neutron absorbtivity. Rapid decay of induced radioactivity.

ALLOY STEELS

Standard, Tentative Standard (TS) & Boron Open Hearth & Electric Furnace Steel—Bars, Billets, Blooms, Slabs

SAE or AISI Number	C	Mn	P Max	S Max	Si	Ni	Cr	Mo
1330	0.28–0.33	1.60–1.90	0.040	0.040	0.20–0.35	.....	.....	.....
1335	0.33–0.38	1.60–1.90	0.040	0.040	0.20–0.35	.....	.....	.....
1340	0.38–0.43	1.60–1.90	0.040	0.040	0.20–0.35	.....	.....	.....
1345	0.43–0.48	1.60–1.90	0.040	0.040	0.20–0.35	.....	.....	.....
TS 14B35*	0.33–0.38	0.75–1.00	....	....	0.20–0.35	.....	.....	.....
TS 14B50*	0.48–0.53	0.75–1.00	....	....	0.20–0.35	.....	.....	.....
E2517**	0.15–0.20	0.45–0.60	0.025	0.025	0.20–0.35	4.75–5.25	.....	.....
3135	0.33–0.38	0.60–0.80	0.040	0.040	0.20–0.35	1.10–1.40	0.55–0.75	.....
3140	0.38–0.43	0.70–0.90	0.040	0.040	0.20–0.35	1.10–1.40	0.55–0.75	.....
E3310**	0.08–0.13	0.45–0.60	0.025	0.025	0.20–0.35	3.25–3.75	1.40–1.75	.....
4012	0.09–0.14	0.75–1.00	0.040	0.040	0.20–0.35	.....	.....	0.15–0.25
4023	0.20–0.25	0.70–0.90	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4024	0.20–0.25	0.70–0.90	0.040	0.035–0.050	0.20–0.35	.....	.....	0.20–0.30
4027	0.25–0.30	0.70–0.90	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4028	0.25–0.30	0.70–0.90	0.040	0.035–0.050	0.20–0.35	.....	.....	0.20–0.30
4032	0.30–0.35	0.70–0.90	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4037	0.35–0.40	0.70–0.90	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4042	0.40–0.45	0.70–0.90	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4047	0.45–0.50	0.70–0.90	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4063	0.60–0.67	0.75–1.00	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4068	0.63–0.70	0.75–1.00	0.040	0.040	0.20–0.35	.....	.....	0.20–0.30
4118	0.18–0.23	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.40–0.60	0.08–0.15
4130	0.28–0.33	0.40–0.60	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
4135	0.33–0.38	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
4137	0.35–0.40	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
4140	0.38–0.43	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
TS 4140*	0.38–0.43	0.80–1.05	....	....	0.20–0.35	.....	0.90–1.20	0.08–0.15
4142	0.40–0.45	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
4145	0.43–0.48	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
4147	0.45–0.50	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
4150	0.48–0.53	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15–0.25
TS 4150*	0.48–0.53	0.80–1.05	....	....	0.20–0.35	.....	0.90–1.20	0.08–0.15
				V				
TS 43BV12*	0.08–0.13	0.75–1.00	....	0.03 min	0.20–0.40	1.65–2.00	0.40–0.60	0.20–0.30
				S				
4320	0.17–0.22	0.45–0.65	0.040	0.040	0.20–0.35	1.65–2.00	0.40–0.60	0.20–0.30
4337	0.35–0.40	0.60–0.80	0.040	0.040	0.20–0.35	1.65–2.00	0.70–0.90	0.20–0.30
E4337*	0.35–0.40	0.65–0.85	0.025	0.025	0.20–0.35	1.65–2.00	0.70–0.90	0.20–0.30
4340	0.38–0.43	0.60–0.80	0.040	0.040	0.20–0.35	1.65–2.00	0.70–0.90	0.20–0.30
E4340	0.38–0.43	0.65–0.85	0.025	0.025	0.20–0.35	1.65–2.00	0.70–0.90	0.20–0.30
46B12	0.10–0.15	0.45–0.65	0.040	0.040	0.20–0.35	1.65–2.00	.....	0.20–0.30
4615	0.13–0.18	0.45–0.65	0.040	0.040	0.20–0.35	1.65–2.00	.....	0.20–0.30
4617	0.15–0.20	0.45–0.65	0.040	0.040	0.20–0.35	1.65–2.00	.....	0.20–0.30
4620	0.17–0.22	0.45–0.65	0.040	0.040	0.20–0.35	1.65–2.00	.....	0.20–0.30
4621	0.18–0.23	0.70–0.90	0.040	0.040	0.20–0.35	1.65–2.00	.....	0.20–0.30
4640	0.38–0.43	0.60–0.80	0.040	0.040	0.20–0.35	1.65–2.00	.....	0.20–0.30
4720	0.17–0.22	0.50–0.70	0.040	0.040	0.20–0.35	0.90–1.20	0.35–0.55	0.15–0.25
4815	0.13–0.18	0.40–0.60	0.040	0.040	0.20–0.35	3.25–3.75	.....	0.20–0.30
4817	0.15–0.20	0.40–0.60	0.040	0.040	0.20–0.35	3.25–3.75	.....	0.20–0.30
4820	0.18–0.23	0.50–0.70	0.040	0.040	0.20–0.35	3.25–3.75	.....	0.20–0.30
5015	0.12–0.17	0.30–0.50	0.040	0.040	0.20–0.35	.....	0.30–0.50	.....
50B30*	0.28–0.33	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.40–0.60	.....
50B40	0.38–0.43	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.40–0.60	.....
50B44	0.43–0.48	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.40–0.60	.....
5046	0.43–0.50	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.20–0.35	.....
50B46	0.43–0.50	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.20–0.35	.....
50B50	0.48–0.53	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.40–0.60	.....
50B60	0.55–0.65	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.40–0.60	.....
5120	0.17–0.22	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.70–0.90	.....
5130	0.28–0.33	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.80–1.10	.....
5132	0.30–0.35	0.60–0.80	0.040	0.040	0.20–0.35	.....	0.75–1.00	.....
5135	0.33–0.38	0.60–0.80	0.040	0.040	0.20–0.35	.....	0.80–1.05	.....
5140	0.38–0.43	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.70–0.90	.....
5145	0.43–0.48	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.70–0.90	.....
5147	0.45–0.52	0.70–0.95	0.040	0.040	0.20–0.35	.....	0.85–1.15	.....
5150	0.48–0.53	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.70–0.90	.....
5155	0.50–0.60	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.70–0.90	.....
5160	0.55–0.65	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.70–0.90	.....
51B60	0.55–0.65	0.75–1.00	0.040	0.040	0.20–0.35	.....	0.70–0.90	.....
E50100**	0.95–1.10	0.25–0.45	0.025	0.025	0.20–0.35	.....	0.40–0.60	.....
E51100**	0.95–1.10	0.25–0.45	0.025	0.025	0.20–0.35	.....	0.90–1.15	.....
E52100**	0.95–1.10	0.25–0.45	0.025	0.025	0.20–0.35	.....	1.30–1.60	.....
								V
6120	0.17–0.22	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.70–0.90	0.10 min
6150	0.48–0.53	0.70–0.90	0.040	0.040	0.20–0.35	.....	0.80–1.10	0.15 min
								Mo
8115	0.13–0.18	0.70–0.90	0.040	0.040	0.20–0.35	0.20–0.40	0.30–0.50	0.08–0.15
81B45	0.43–0.48	0.75–1.00	0.040	0.040	0.20–0.35	0.20–0.40	0.35–0.55	0.08–0.15
8615	0.13–0.18	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8617	0.15–0.20	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8620	0.18–0.23	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8622	0.20–0.25	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8625	0.23–0.28	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8627	0.25–0.30	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8630	0.28–0.33	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8637	0.35–0.40	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8640	0.38–0.43	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8642	0.40–0.45	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8645	0.43–0.48	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
86B45	0.43–0.48	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8650	0.48–0.53	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8655	0.50–0.60	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8660	0.55–0.65	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.15–0.25
8720	0.18–0.23	0.70–0.90	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.20–0.30
8735*	0.33–0.38	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.20–0.30
8740	0.38–0.43	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.20–0.30
8742	0.40–0.45	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.20–0.30
8822	0.20–0.25	0.75–1.00	0.040	0.040	0.20–0.35	0.40–0.70	0.40–0.60	0.30–0.40
9255	0.50–0.60	0.70–0.95	0.040	0.040	1.80–2.20	.....	.....	.....
9260	0.55–0.65	0.70–1.00	0.040	0.040	1.80–2.20	.....	.....	.....
9261	0.55–0.65	0.75–1.00	0.040	0.040	1.80–2.20	.....	0.10–0.25	.....
9262	0.55–0.65	0.75–1.00	0.040	0.040	1.80–2.20	.....	0.25–0.40	.....

SAE or AISI Number	C	Mn	P Max	S Max	Si	Ni	Cr
E9310**	0.08–0.13	0.45–0.65	0.025	0.025	0.20–0.35	3.00–3.50	1.00–1.40
E9314*	0.11–0.17	0.40–0.70	0.025	0.025	0.20–0.35	3.00–3.50	1.00–1.40
94B15	0.13–0.18	0.75–1.00	0.040	0.040	0.20–0.35	0.30–0.60	0.30–0.50
94B17	0.15–0.20	0.75–1.00	0.040	0.040	0.20–0.35	0.30–0.60	0.30–0.50
94B30	0.28–0.33	0.75–1.00	0.040	0.040	0.20–0.35	0.30–0.60	0.30–0.50
94B40	0.38–0.43	0.75–1.00	0.040	0.040	0.20–0.35	0.30–0.60	0.30–0.50
9840	0.38–0.43	0.70–0.90	0.040	0.040	0.20–0.35	0.85–1.15	0.70–0.90
9850	0.48–0.53	0.70–0.90	0.040	0.040	0.20–0.35	0.85–1.15	0.70–0.90
Standard Nitriding Steel						Al	
	0.38–0.43	0.50–0.70	0.040	0.040	0.20–0.40	0.95–1.30	1.40–1.80

Source—American Iron & Steel Institute, 1957.

*No corresponding SAE number.
**SAE numbers do not have prefix E

NOTES
1. TS denotes tentative standard steels.
2. Boron steels indicated by B can be expected to have 0.0005 per cent minimum boron content.
3. Grades with prefix E are manufactured by basic electric furnace process. All others are normally produced by basic open-hearth process but may be made by basic electric furnace process with adjustments in phosphorus and sulfur.
4. Ranges & limits apply to steel not exceeding 200 sq in. cross-sectional area.
5. All chemical ranges & limits are subject to standard variations for check analysis over or under specification.
6. Phosphorus and sulfur limitations for
   Basic electric furnace .....
   Basic open hearth .....
   Acid electric furnace .....
   Acid open hearth .....
7. Minimum silicon limit for acid open h
   electric furnace alloy steel is 0.15
8. Small quantities of certain elements
   are not specified or required. They a
   as incidental & may be present in th
   amounts: Copper 0.35%; nickel, 0.2
   0.20; molybdenum, 0.06.
9. Where minimum & maximum sulfu
   shown, it is indicative of resulfurized

ZINC Diecasting Alloys

ASTM, SAE Number, & Commercial Name	Composition Limits ASTM B86-57T Specification	Outstanding Properties	Typic Applicat
AG40A SAE-903 Zamak-3	Cu 0.25 max; Al 3.5-4.3; Mg 0.03-0.08; Fe 0.100 max; Pb 0.007 max; Cd 0.005 max; Sn 0.005 max	Retention of impact strength & dimensions. Used where stability is important.	Carburetors, fuel erator hardware, chines, parking sion, any of below
AC41A SAE-925 Zamak-5	Cu 0.75-1.25; Al 3.5-4.3; Mg 0.03-0.08; Fe 0.100 max; Pb 0.007 max; Cd 0.005 max; Sn 0.005 max	Greater hardness & tensile strength. Used where hardness is important.	Business machines, hardware, lawn small tools, any of

TITANIUM

Material (Nominal Composition)	SPECIFICATIONS AMS	Military	ASTM	Mallo Shar
Unalloyed	4902	.....	.....	MST-40
Unalloyed	4900A	Mil-T-12117(ord)	B265-52T-Gr2	MST-55
Unalloyed	4901B 4921	Mil-T-90474-CL1 Mil-T-7993A-CL1 Mil-T-12117-CL70	B265-52T-Gr3	MST-70
3Al-5Cr	4927	Mil-T-9047A(ASG)	.....	MST-3Al
5Al-2.75Cr-1.25Fe*	....	.....	.....	.....
5Al-1.5Fe-1.4Cr-1.2Mo*	49AC	Mil-T-9047B(ASG)	.....	.....
5Al-2.5Sn	49AE	Mil-T-12117(ord)CL 120 Mil-T-009046	.....	MST-5Al
6Al-4V*	49AA	Mil-T-12117(ord)CL 120 Mil-T-009046	.....	MST-6Al
2.2Fe-2.1Cr-2.0Mo*	4923	Mil-T-9047A(ASG)	.....	.....
8 Mn*	4908	Mil-T-009046	.....	MST-8M
3.25 Mn-2.25 Al	....	Mil-T-12117(ord)CL 100	.....	.....
4Al-4Mn*	4925A	Mil-T-12117(ord)CL 120	.....	MST-4Al
6.5Al-3.75Mo*	....	.....	.....	.....
2.5Al-16V*	....	.....	.....	MST-2.5
8Al-2Cb-1Ta	....	.....	.....	MST-821
4Al-3Mo-1V*	....	.....	.....	.....
6.5Al-3Mo-1V*	....	.....	.....	.....

*Indicates high response to heat treatment.
S—Rolled flat products—sheets, strip, plates.
B—Bars and billets.
**Age hardened.
E—Extrusions.
W—Wire.
T—T
F—F

	Mo
.40	0.08–0.15
.40	0.08–0.15
.50	0.08–0.15
.50	0.08–0.15
.50	0.08–0.15
.50	0.08–0.15
.90	0.20–0.30
.90	0.20–0.30
.80	0.30–0.40

ix E.

for each process:
... 0.025% max
... 0.040% max
... 0.050% max
... 0.050% max
n hearth or acid
5 per cent.
ts in alloy steel
y are considered
these maximum
0.25; chromium,

ulfur content is
ized steel.

ypical
ications

el pumps, refrig-
re, washing ma-
meters, televi-
low.

nes, gears, cams,
n mowers, fans,
r of above.

H-STEELS Standard, Tentative Standard (TS) & Boron Open Hearth & Electric Furnace Steels—Bars, Billets, Blooms

SAE or AISI NUMBER	C	Mn	Si	Ni	Cr	Mo
1330–H	0.27–0.33	1.45–2.05	0.20–0.35	.....	.....	.....
1335–H	0.32–0.38	1.45–2.05	0.20–0.35	.....	.....	.....
1340–H	0.37–0.44	1.45–2.05	0.20–0.35	.....	.....	.....
TS 14B35–H	0.32–0.38	0.65–1.10	0.20–0.35	.....	.....	.....
TS 14B50–H	0.47–0.54	0.65–1.10	0.20–0.35	.....	.....	.....
2517–H	0.14–0.20	0.30–0.70	0.20–0.35	4.70–5.30	.....	.....
3135–H	0.32–0.38	0.50–0.90	0.20–0.35	1.00–1.45	0.45–0.85	.....
3140–H	0.37–0.44	0.60–1.00	0.20–0.35	1.00–1.45	0.45–0.85	.....
3310–H	0.07–0.13	0.30–0.70	0.20–0.35	3.20–3.80	1.30–1.80	.....
4027–H	0.24–0.30	0.60–1.00	0.20–0.35	.....	.....	0.20–0.30
4028–H*	0.24–0.30	0.60–1.00	0.20–0.35	.....	.....	0.20–0.30
4032–H	0.29–0.35	0.60–1.00	0.20–0.35	.....	.....	0.20–0.30
4037–H	0.34–0.41	0.60–1.00	0.20–0.35	.....	.....	0.20–0.30
4042–H	0.39–0.46	0.60–1.00	0.20–0.35	.....	.....	0.20–0.30
4047–H	0.44–0.51	0.60–1.00	0.20–0.35	.....	.....	0.20–0.30
4063–H	0.59–0.69	0.65–1.10	0.20–0.35	.....	.....	0.20–0.30
4068–H	0.62–0.72	0.65–1.10	0.20–0.35	.....	.....	0.20–0.30
4118–H	0.17–0.23	0.60–1.00	0.20–0.35	.....	0.30–0.70	0.08–0.15
4130–H	0.27–0.33	0.30–0.70	0.20–0.35	.....	0.75–1.20	0.15–0.25
4135–H	0.32–0.38	0.60–1.00	0.20–0.35	.....	0.75–1.20	0.15–0.25
4137–H	0.34–0.41	0.60–1.00	0.20–0.35	.....	0.75–1.20	0.15–0.25
4140–H	0.37–0.44	0.65–1.10	0.20–0.35	.....	0.75–1.20	0.15–0.25
TS 4140–H	0.37–0.44	0.70–1.20	0.20–0.35	.....	0.85–1.30	0.08–0.15
4142–H	0.39–0.46	0.65–1.10	0.20–0.35	.....	0.75–1.20	0.15–0.25
4145–H	0.42–0.49	0.65–1.10	0.20–0.35	.....	0.75–1.20	0.15–0.25
4147–H	0.44–0.51	0.65–1.10	0.20–0.35	.....	0.75–1.20	0.15–0.25
4150–H	0.47–0.54	0.65–1.10	0.20–0.35	.....	0.75–1.20	0.15–0.25
TS 4150–H	0.47–0.54	0.70–1.20	0.20–0.35	.....	0.85–1.30	0.08–0.15
4320–H	0.17–0.23	0.40–0.70	0.20–0.35	1.55–2.00	0.35–0.65	0.20–0.30
4337–H	0.34–0.41	0.55–0.90	0.20–0.35	1.55–2.00	0.65–0.95	0.20–0.30
4340–H	0.37–0.44	0.55–0.90	0.20–0.35	1.55–2.00	0.65–0.95	0.20–0.30
E4340–H	0.37–0.44	0.60–0.95	0.20–0.35	1.55–2.00	0.65–0.95	0.20–0.30
46B12–H	0.09–0.15	0.35–0.75	0.20–0.35	1.55–2.00	.....	0.20–0.30
4620–H	0.17–0.23	0.35–0.75	0.20–0.35	1.55–2.00	.....	0.20–0.30
4621–H	0.17–0.23	0.60–1.00	0.20–0.35	1.55–2.00	.....	0.20–0.30
4640–H	0.37–0.44	0.50–0.90	0.20–0.35	1.55–2.00	.....	0.20–0.30
4720–H	0.17–0.23	0.45–0.75	0.20–0.35	0.85–1.25	0.30–0.60	0.15–0.25
4815–H	0.12–0.18	0.30–0.70	0.20–0.35	3.20–3.80	.....	0.20–0.30
4817–H	0.14–0.20	0.30–0.70	0.20–0.35	3.20–3.80	.....	0.20–0.30
4820–H	0.17–0.23	0.40–0.80	0.20–0.35	3.20–3.80	.....	0.20–0.30
5046–H	0.43–0.50	0.65–1.10	0.20–0.35	.....	0.13–0.43	.....
50B46–H	0.43–0.50	0.65–1.10	0.20–0.35	.....	0.13–0.43	.....
50B60–H	0.55–0.65	0.65–1.10	0.20–0.35	.....	0.30–0.70	.....
5120–H	0.17–0.23	0.60–1.00	0.20–0.35	.....	0.60–1.00	.....
5130–H	0.27–0.33	0.60–1.00	0.20–0.35	.....	0.75–1.20	.....
5132–H	0.29–0.35	0.50–0.90	0.20–0.35	.....	0.65–1.10	.....
5135–H	0.32–0.38	0.50–0.90	0.20–0.35	.....	0.70–1.15	.....
5140–H	0.37–0.44	0.60–1.00	0.20–0.35	.....	0.60–1.00	.....
5145–H	0.42–0.49	0.60–1.00	0.20–0.35	.....	0.60–1.00	.....
5147–H	0.45–0.52	0.60–1.05	0.20–0.35	.....	0.80–1.25	.....
5150–H	0.47–0.54	0.60–1.00	0.20–0.35	.....	0.60–1.00	.....
5160–H	0.55–0.65	0.65–1.10	0.20–0.35	.....	0.60–1.00	.....
51B60–H	0.55–0.65	0.65–1.10	0.20–0.35	.....	0.60–1.00	.....
						V
6120–H	0.17–0.23	0.60–1.00	0.20–0.35	.....	0.60–1.00	0.10 min
6150–H	0.47–0.54	0.60–1.00	0.20–0.35	.....	0.75–1.20	0.15 min
						Mo
81B45–H	0.42–0.49	0.70–1.05	0.20–0.35	0.15–0.45	0.30–0.60	0.08–0.15
8617–H	0.14–0.20	0.60–0.95	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8620–H	0.17–0.23	0.60–0.95	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8622–H	0.19–0.25	0.60–0.95	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8625–H	0.22–0.28	0.60–0.95	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8627–H	0.24–0.30	0.60–0.95	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8630–H	0.27–0.33	0.60–0.95	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8637–H	0.34–0.41	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8640–H	0.37–0.44	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8642–H	0.39–0.46	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8645–H	0.42–0.49	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
86B45–H	0.42–0.49	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8650–H	0.47–0.54	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8655–H	0.50–0.60	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8660–H	0.55–0.65	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.15–0.25
8720–H	0.17–0.23	0.60–0.95	0.20–0.35	0.35–0.75	0.35–0.65	0.20–0.30
8740–H	0.37–0.44	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.20–0.30
8742–H	0.39–0.46	0.70–1.05	0.20–0.35	0.35–0.75	0.35–0.65	0.20–0.30
9260–H	0.55–0.65	0.65–1.10	1.70–2.20	.....	.....	.....
9261–H	0.55–0.65	0.65–1.10	1.70–2.20	.....	0.05–0.35	.....
9262–H	0.55–0.65	0.65–1.10	1.70–2.20	.....	0.20–0.50	.....
9310–H	0.07–0.13	0.40–0.70	0.20–0.35	2.95–3.55	1.00–1.45	0.08–0.15
94B15–H	0.12–0.18	0.70–1.05	0.20–0.35	0.25–0.65	0.25–0.55	0.08–0.15
94B17–H	0.14–0.20	0.70–1.05	0.20–0.35	0.25–0.65	0.25–0.55	0.08–0.15
9840–H	0.37–0.44	0.60–0.95	0.20–0.35	0.80–1.20	0.65–0.95	0.20–0.30
9850–H	0.47–0.54	0.60–0.95	0.20–0.35	0.80–1.20	0.65–0.95	0.20–0.30

Source—American Iron & Steel Institute, 1957.
*Sulfur content 0.035-0.050%.

NOTES
1. TS denotes tentative standard steels.
2. Boron steels indicated by B can be expected to have 0.0005% min boron content.
3. Notes 4, 5, 6, 7, & 8 on Alloy Steels apply to H-Steels.

	PRODUCER'S DESIGNATION				MECHANICAL PROPERTIES (Annealed—Typical)				
llory-haron	Republic	Rem-Cru	TMCA	Mill Forms	Tensile Strength psi	Yield Strength psi	Elong %	R.A. %	Properties & Applications
40	RS-40	A-40	Ti-55A	S,B,E,W,T	65,000	50,000	28	50	Nonstructural aircraft & corrosion uses where maximum ductility & formability are needed. Fusion weldable. Processing equipment, fittings, heat exchangers, valve trim, marine uses.
55	RS-55	A-55	Ti-65A	S,B,E,W	80,000	65,000	25	50	Properties & uses same as above except it has higher strength. Used as wire & rods for welding other titanium alloys, anodizing racks.
70	RS-70	A-70	Ti-75A Ti-100A	S,B,E,W	90,000	80,000	20	40	Used for same purposes as above grades, but where higher strengths are needed with some sacrifice in ductility & formability. Aircraft nacelles, webs, stiffeners, angles, & shrouds, fire walls, fasteners, engine rings, ammunition boxes, gun blast panels, shroud spacers, anodizing racks.
3Al-5Cr	.....	.....	.....	B,F	155,000	145,000	13	35	Aircraft landing gear forgings; fasteners.
.....	RS-140	.....	.....	B	158,000	147,000	16	40	High strength forgings & sheet parts. Heat treatment increases tensile strength to 180,000 psi with corresponding increase in yield strength. (Heat treated sheets still developmental).
.....	.....	.....	Ti-155A	B,F,E,W	155,000	145,000	15	35	Heat treatable forging stock for aircraft components. Heat treatment gives average yield strength of 173,000, tensile strength of 180,000 psi. Heat-treat capability guaranteed to 170,000 psi.
5Al-2.5Sn	RS-110C	A-110AT	Ti-5Al-2.5Sn	S,B,W,F	125,000	115,000	18	40	Forgings & welded sheet assemblies where creep resistance up to 900° F is required. Aircraft engine compressor case housings, tail cones, shroud spacers, stiffeners, high strength fusion welded assemblies.
6Al-4V	RS-120A	C-120AV	Ti-6Al-4V	S,B,E,W,F	145,000	130,000	15	40	Medium high strength aircraft & engine forgings; ordnance equipment where good elevated temperature strength & stability are needed with good machinability. Compressor wheels & blades, spacers, elevon hinge supports, fuel injection nozzles, fasteners, impeller wheels, stabilizers; sheet quenched & aged gives high strength.
.....	.....	.....	Ti-140A	S,B,F	130,000	115,000	15	25	Airframes, skins.
8Mn	RS-110A	C-110M	.....	S	130,000	120,000	15	..	For medium, high strength sheet applications where good formability is needed. Not used for fusion welded assemblies or above 650° F. Longerons, bulkheads, channels, stressed skins, & frames.
.....	RS-110B	.....	.....	S,B,W	130,000	120,000	10	..	Medium strength with good ductility; fusion weldable. Tanks, stiffeners.
4Al-4Mn	RS-130	C-130AM	.....	B,W,F	145,000	130,000	15	40	High strength airframe & engine forgings & fasteners where good weld ductility is not needed. Industrial equipment requiring maximum strength with good corrosion & erosion resistance. Aircraft fasteners, wing panels.
.....	.....	C-130AMo	.....	B,F	150,000	140,000	10	25	High strength airframe & engine forgings. Heat treating response better than 6Al-4V; elevated temperature stability better than 4Al-4Mn. Yield strength when heat treated, 170,000 psi.
2.5Al-16V	.....	.....	.....	B,W,F,S	175,000**	160,000	6	..	Airframe skins, webs, angles & shrouds, fasteners. Age hardened parts have good short time hot strength (yield strength about 100,000 psi up to 800° F).
321	.....	.....	.....	B,W,F,S,E	135,000	125,000	15	40	Compressor blades, fire walls, tail cones, stiffeners, welded assemblies. High strength forgings. Has exceptional high temperature strength—about 200° F advantage in 400-1000° F range.
.....	.....	.....	Ti-4Al-3Mo-1V	Sheet	133,000	123,000	11	..	Heat treatable sheets with good formability in solution condition. To get 155,000 psi yield strength: Heat treat at 1650°F, water quench, age at 925° F for 12 hours.
.....	.....	.....	Ti-6.5Al-3Mo-1V	Bar	155,000	150,000	17	45	Improved creep resistance. To get 167,000 psi yield strength: Heat treat at 1650° F, water quench, age at 925° F for 24 hours.

—Tubes.
—Forgings.

Producers: 1. Mallory-Sharon Titanium Corp., Niles, Ohio.
2. Rem-Cru Titanium Inc., Midland, Pa.
3. Republic Steel Corp., Massillon, Ohio.
4. Titanium Metals Corp. of America, 233 Broadway, New York 7, N. Y.

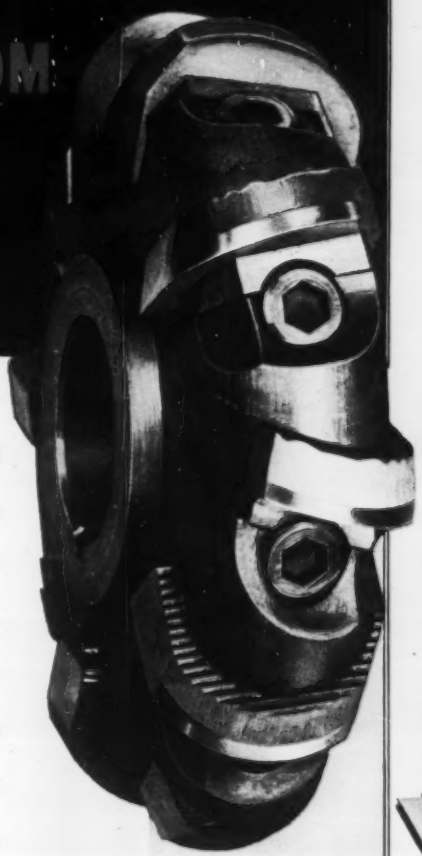
STAINLESS and Heat-Resistant Steels

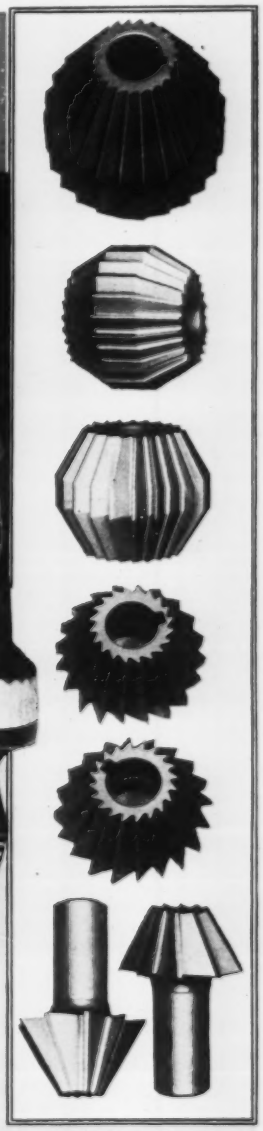
AISI No.	C	Mn Max	Si Max	Cr	Ni	P Max	S Max	Properties & Applications
201	0.15 max	5.5–7.50	1.00	16–18	3.5–5.5	0.060	0.030	Low-nickel alternate for 301; somewhat higher strength than 301. General applications similar to 301.
	Other: N 0.25 max							
202	0.15 max	7.5–10.00	1.00	17–19	4–6	0.060	0.030	Low-nickel alternate for 302; somewhat higher strength than 302. General applications similar to 302.
	Other: N 0.25 max							
301	0.15 max	2.00	1.00	16–18	6–8	0.045	0.030	Rapid work hardening. Railroad cars, trailer bodies, aircraft structurals.
302	0.15 max	2.00	1.00	17–19	8–10	0.045	0.030	General purpose, chromium nickel type. Trim, food handling equipment, jewelry, aircraft cowling, antennas, springs, architectural, cookware.
302B	0.15 max	2.00	2.0–3.0	17–19	8–10	0.045	0.030	Higher scaling resistance at elevated temperatures than 302. Furnace parts, still liners, heating elements.
303	0.15 max	2.00	1.00	17–19	8–10	0.20	0.15 min	Free machining; lower galling & seizing tendency than 302. Screw machine products, shafts, valves.
	Other: Mo 0.60 max‡; Zr 0.60 max‡							
303Se	0.15 max	2.00	1.00	17–19	8–10	0.20	0.06	Better transverse properties, lower machinability, better finish than 303; improved workability.
	Other: Se 0.15 min							
304	0.08 max	2.00	1.00	18–20	8–12	0.045	0.030	General purpose alloy for welding. Chemical & food processing equipment, recording wire.
304L	0.03 max	2.00	1.00	18–20	8–12	0.045	0.030	Weldments for corrosive conditions where intergranular carbide precipitation must be avoided. Atomic energy applications.
305	0.12 max	2.00	1.00	17–19	10–13	0.045	0.030	Low work-hardening rate. Maximum plasticity for forming, spinning, cold heading.
308	0.08 max	2.00	1.00	19–21	10–12	0.045	0.030	Welding rods & electrodes.
309	0.20 max	2.00	1.00	22–24	12–15	0.045	0.030	High scale resistance, good strength at high temperatures. Aircraft heaters, heat treating equipment, annealing covers, furnace parts.
309S	0.08 max	2.00	1.00	22–24	12–15	0.045	0.030	Weldments with high scale resistance.
310	0.25 max	2.00	1.50	24–26	19–22	0.045	0.030	Like 309 but even higher heat resistance. Excellent for general use. Heat exchangers, furnace parts, combustion chambers, welding rods.
310S	0.08 max	2.00	1.50	24–26	19–22	0.045	0.030	Like 309S but has even higher heat resistance.
314	0.25 max	2.00	1.5–3.0	23–26	19–22	0.045	0.030	Highest heat resistance. Uses similar to 310. Resistant to carburizing. Heat treating fixtures.
316	0.08 max	2.00	1.00	16–18	10–14	0.045	0.030	Higher resistance to corrosives affecting other stainless steels. High creep resistance. High temperature parts, chemical & pulp handling equipment, photographic & food equipment.
	Other: Mo 2.00–3.00							
316L	0.03 max	2.00	1.00	16–18	10–14	0.045	0.030	Version of 316 for weldments where intergranular carbide precipitation must be avoided. Permits stress relief at 1550–1650° F.
	Other: Mo 2.00–3.00							
317	0.08 max	2.00	1.00	18–20	11–15	0.045	0.030	Higher in corrosion resistance than 316.
	Other: Mo 3.00–4.00							
321	0.08 max	2.00	1.00	17–19	9–12	0.045	0.030	For weldments subject to severely corrosive conditions & service in 800–1650° F range. Aircraft exhaust manifolds, boiler shells, expansion joints, process equipment.
	Other: Ti 5xC min							
347	0.08 max	2.00	1.00	17–19	9–13	0.045	0.030	For uses similar to 321. More widely used for welded process equipment.
	Other: Cb-Ta 10xC min							
348	0.08 max	2.00	1.00	17–19	9–13	0.045	0.030	Equivalent to 347. For atomic energy applications due to low retentivity.
	Other: Cb-Ta 10xC min, Ta 0.10 max							
403*	0.15 max	1.00	0.50	11.5–13	.....	0.040	0.030	Steam turbine blades, jet engine compressor blades, highly stressed parts.
405	0.08 max	1.00	1.00	11.5–14.5	.....	0.040	0.030	Nonhardenable. For welded assemblies where air-hardening of 410 or 403 is objectionable.
	Other: Al 0.10–0.30							
410*	0.15 max	1.00	1.00	11.5–13.5	.....	0.040	0.030	General purpose corrosion & heat resistance. Hardenable by heat treatment. Coal screens, low priced cutlery, machine parts, valve trim.
414*	0.15 max	1.00	1.00	11.5–13.5	1.25–2.50	0.040	0.030	High-strength version of 410. Rules & straight edges, mild springs, scraper knives.
416*	0.15 max	1.25	1.00	12–14	.....	0.06	0.15 min	Free machining. Bolts, nuts, screws, carburetor parts, fishing reels, golf club heads, instrument parts, screw machine parts, valve trim.
	Other: Mo 0.60 max‡; Zr 0.60 max‡							
416Se*	0.15 max	1.25	1.00	12–14	.....	0.06	0.06	Higher transverse properties, better finish, lower machinability than 416; improved workability.
	Other: Se 0.15 min							
420*	Over 0.15	1.00	1.00	12–14	.....	0.040	0.030	High hardness from heat treatment. General purpose cutlery grade. Surgical instruments.
430	0.12 max	1.00	1.00	14–18	.....	0.040	0.030	General purpose, nonhardenable chromium type. Decorative trim, nitric acid tanks, annealing baskets, auto trim, sinks.
430F	0.12 max	1.25	1.00	14–18	.....	0.06	0.15 min	Free-machining bars. Screw machine parts, screws & other fasteners.
	Other: Mo 0.60 max‡; Zr 0.60 max‡							
430FSe	0.12 max	1.25	1.00	14–18	.....	0.06	0.06	Free machining, retaining forgeability. Fine finish quality. Similar to 430F.
	Other: Se 0.15 min							
431*	0.20 max	1.00	1.00	15–17	1.25–2.50	0.040	0.030	Special purpose hardenable type. Aircraft fittings, bolts, paper machinery, windshield wiper arms, beater bars, springs.
440A*	0.60–0.75	1.00	1.00	16–18	.....	0.040	0.030	High strength & corrosion resistance. Hardenable by heat treatment. Toughest high chrome cutlery grade, bearings, seaming rolls, surgical tools.
	Other: Mo 0.75 max							
440B*	0.75–0.95	1.00	1.00	16–18	.....	0.040	0.030	Cutlery grade. Uses similar to 440A.
	Other: Mo 0.75 max							
440C*	0.95–1.20	1.00	1.00	16–18	.....	0.040	0.030	Ball bearing grade. Also bushings, valve parts, cutlery.
	Other: Mo 0.75 max							
446	0.20 max	1.50	1.00	23–27	.....	0.040	0.030	Resistance to high-temperature scaling, hot sulfur-bearing gases & oxidizing acids.
	Other: N 0.25 max							
501*	Over 0.10	1.00	1.00	4–6	.....	0.040	0.030	Moderate resistance to scaling but limited corrosion resistance. Oil industry equipment—stills, heat exchangers, hot lines.
	Other: Mo 0.40–0.65							
502*	0.10 max	1.00	1.00	4–6	.....	0.040	0.030	Uses similar to 501.
	Other: Mo 0.40–0.65							

‡At producer's option; reported only when intentionally added.
*Respond to heat treatment to develop a wide range of mechanical properties.

For lower costs, check these--
10 Production Advantages
--you'll gain when you use

CTR's CUSTOM TOOL ROOM MAINTENANCE DEPARTMENT SERVICE





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5. You'll cut your costs through reduced spoilage, fewer rejects.
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9. You'll have one of the finest tool room maintenance departments in the nation.
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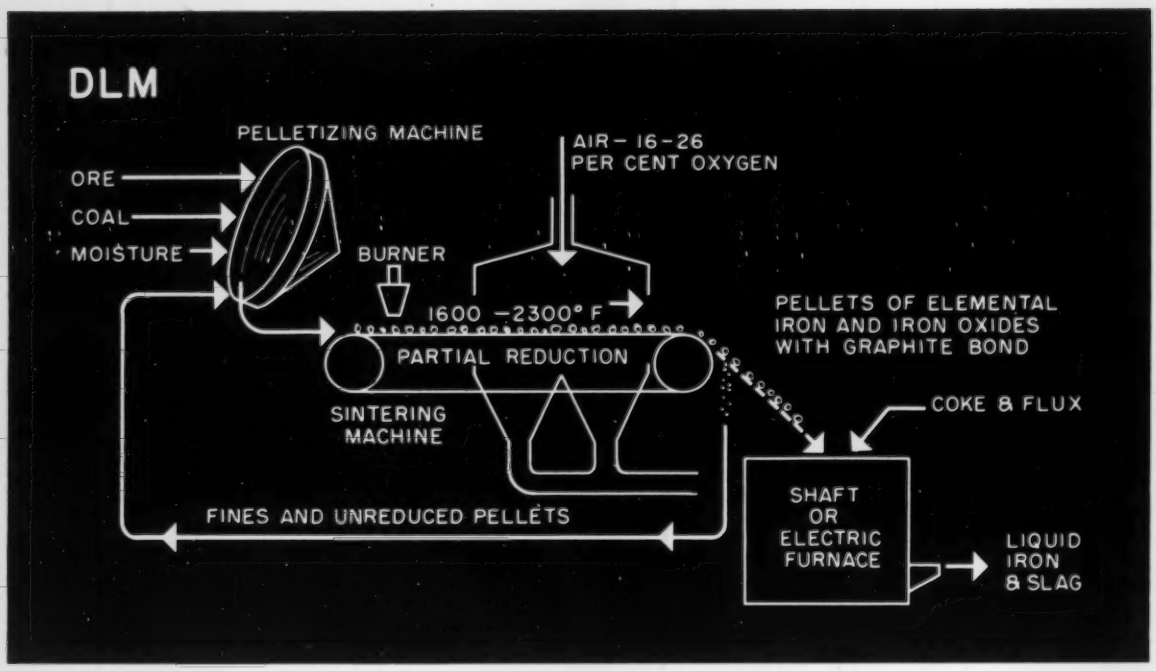
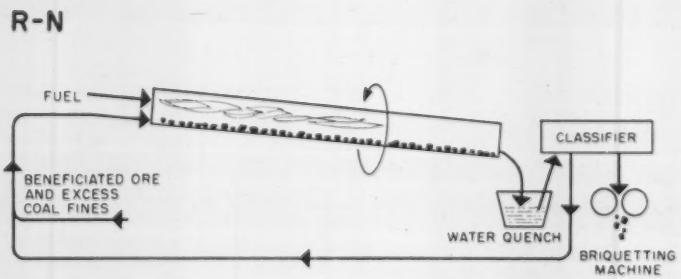


Dwight-Lloyd-McWane process is the latest to enter the direct reduction race. It's an adaptation of a pelletizing-sintering plant

The Case for Direct Reduction

Whether we like it or not, the blast furnace is pricing itself out of the market. Substitute processes offering lower installed costs are ready to move in



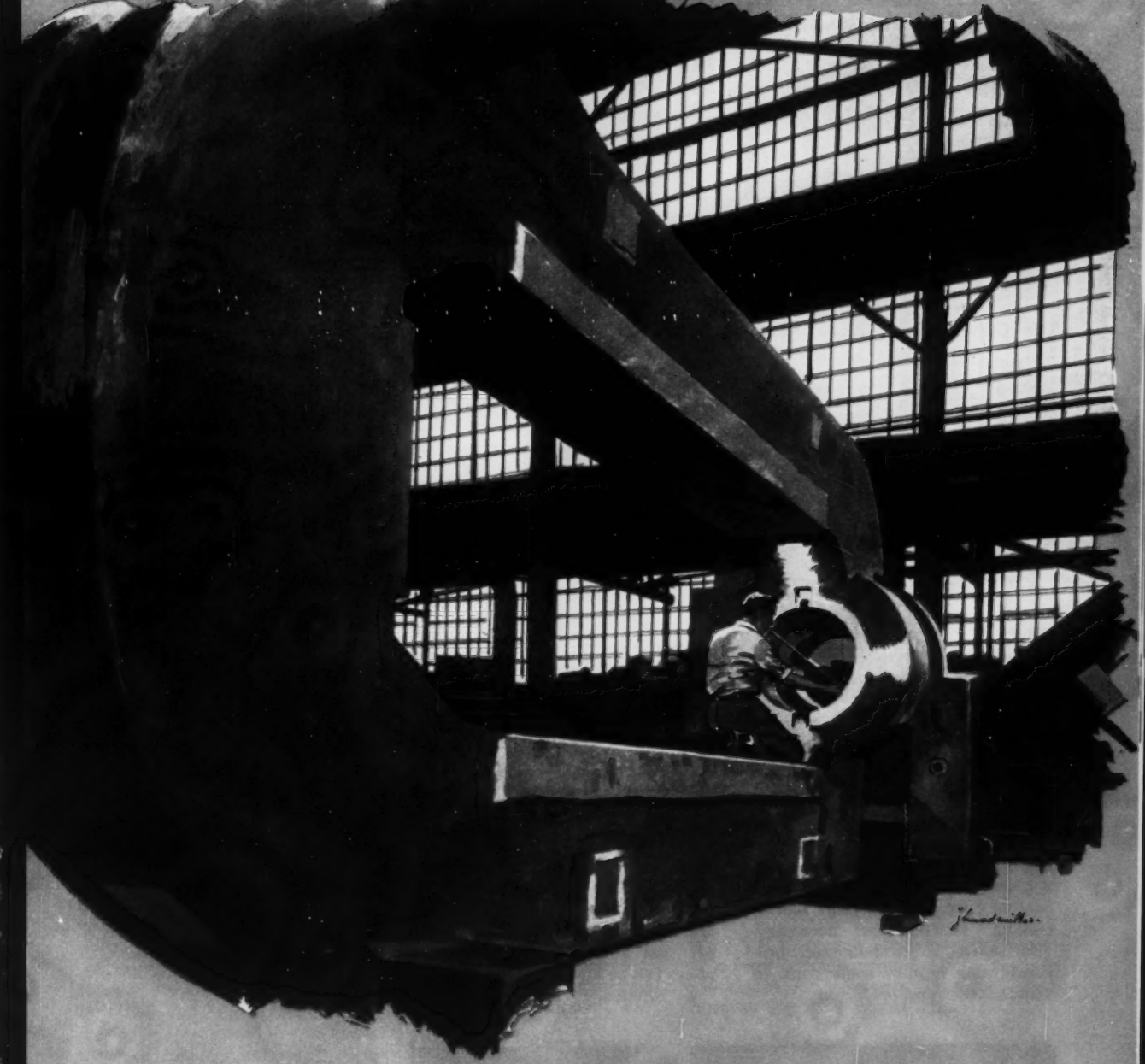
R-N process, well suited to Alabama ores, requires careful heat balance in the kiln to obtain reduction without sticking

A BRITISH writer recently estimated that American research on direct reduction of iron ore is costing $9 million to $12 million a year. Obviously, we are taking the subject seriously again, but why?

Only ten years ago it was a dead issue in the U. S. Steelmen remember vast wartime research that showed we could make iron by dozens of methods—if we were willing to ignore costs. They remember the monumental failures.

To find the answer to "why now?" you have to look at the growth picture. The stock arguments aren't strong enough:

1. Coking coal: Supplies of high quality metallurgical coking coal have been declining steadily, making processes that use lower grade fuel of great importance. (But we're learning how to stretch our



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PLANT AT GLASSPORT, PENNSYLVANIA
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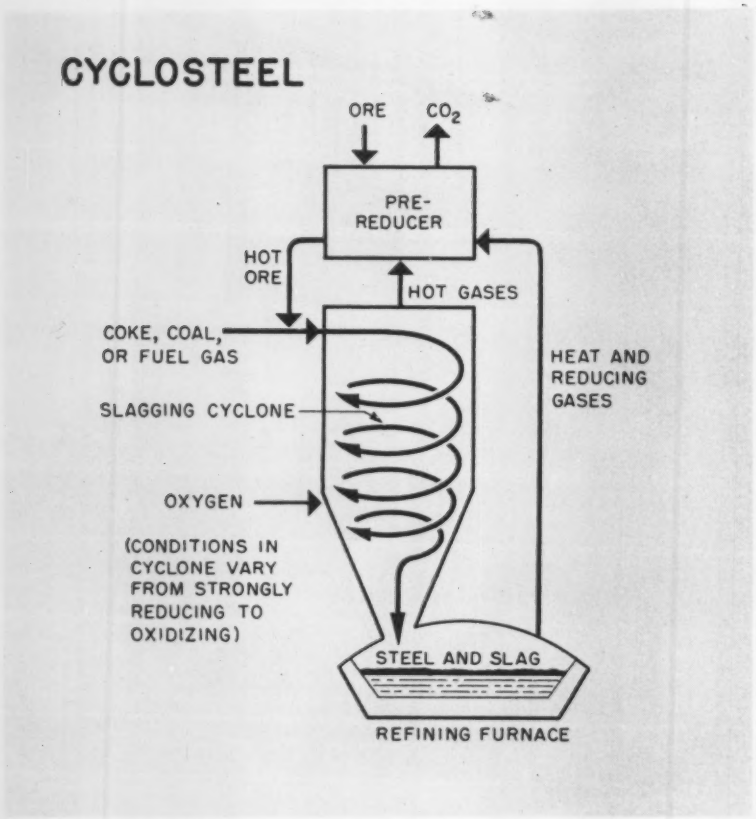


Cyclosteel process theoretically combines reducing-oxidizing reactions to jump from ore directly to steel

coking coal by blending and coal washing.)

2. Iron ore: Supplies of high iron content ore are getting scarce, making beneficiation necessary. (But most direct reduction proposals also require some form of beneficiation and ore sizing.)

3. Scrap: The continued high price of scrap adds attractiveness to any process which will produce an artificial scrap at a lower figure. (But can a scrapmaking process that stands idle when scrap prices fall be justified?)

4. Efficiency: Direct reduction is theoretically more efficient than the blast furnace. (But in practice few schemes have ever approached the efficiency of the blast furnace. None has approached its output).

Expansion—Such arguments will carry more weight as our mineral poverty gets worse. Present interest in direct reduction can only be explained in terms of futures.

If we are to reach our predicted 185 million tons of ingot capacity in 1970, our blast furnace capacity will have to be increased to about 120 million tons—it now stands at 87 million. We are going to have to come up with 33 million more tons of iron a year. Granting that some will come from the improvement of ironmaking facilities, we will still need 65 new blast furnaces (or equivalent) in 13 years.

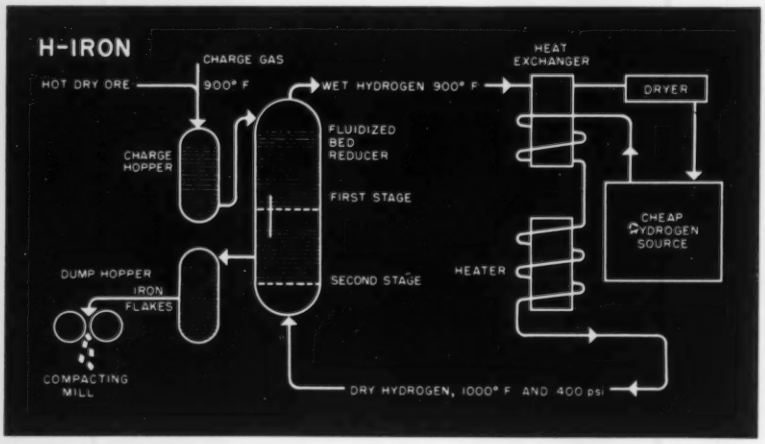
Money—Plain and simply, we aren't going to make all this iron by the blast furnace route. A new blast furnace with auxiliaries costs close to $50 million and will cost more tomorrow. Under present conditions (inflation, unrealistic depreciation, and high taxes), we are going to be forced to build some ironmaking facilities whose installed costs per ton of iron are less than those of the blast furnace—even if operating costs turn out to be higher.

Where and When—Since direct reduction is definitely coming, it seems reasonable to ask how soon and where? The first big installation needs a ready source of iron ore (near a mine or seaport); low cost fuel (soft coal, natural gas, by-product hydrogen, electric power); and a market for hot metal or scrap that is overreaching the supply. The Gulf Coast, southern California, and the far Northwest have been pointed out as fitting these requirements.

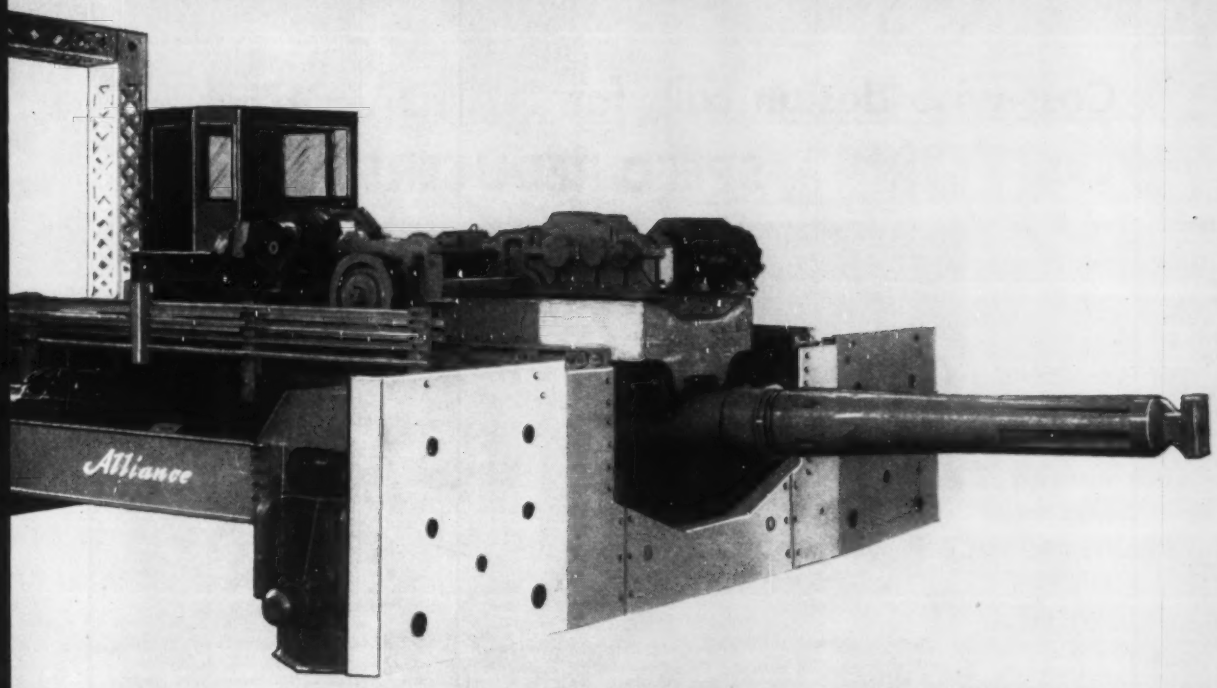
Every major steel company has a pilot plant in operation, or a process in the "serious consideration" stage. At the moment, the R-N process (Republic Steel Corp.-National Lead Co.) probably comes closest to being a production operation. (See box score on Page 185.)

Rotary Kiln — At Republic's Spaulding mine, near Birmingham, a long rotary kiln capable of treating 175 tons of ore a day has been in operation for the last two years. It is charged with a high grade ore

(*Please turn to Page* 185)



H-iron process will get a $3.6 million chance to prove itself by making iron powder for Alan Wood Steel Co.



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STRUCTURAL FABRICATION

COKE PUSHERS

New 12-TON CHARGING MACHINE

• **The NEW Alliance 12-ton,** low-type open hearth Charging Machine has spring-loaded pitman so, if the charging box pushes up over scrap in the furnace, the trolley's front wheels remain on the rails. Trolley always has sufficient traction to retract peel and box from furnace.

• **Each bridge girder** of Alliance's NEW Charging Machines consists of two wide-flanged I-beams welded to form a box section. Between webs of this box section, diaphragms are welded at 3-ft. intervals. This, plus other welded reinforcements, keeps charging machine square and rigid.

• **Machinery deck plate,** extending full length of bridge between main girder and outrigger girder, laterally reinforces the main girder and helps keep charging machine square and stable under all operating conditions.

• **Stabilized, shock-absorbing wheels** operate at rear end of trolley. Two rear wheels engage upper rail; two adjacent wheels engage lower rail. Powerful springs hold wheels in contact with rails at all times. This spring suspension absorbs and disperses engaging and disengaging shock at end of the peel, reducing operator shock and fatigue to a minimum.

• **On eight-wheel bridges,** the four trucks located at corners of the bridge are equalized to compensate for any track irregularities.

• **New hydraulic lock rod** gives operator finger-tip control and eliminates laborious work incident to the hand-operated lock rod. All gears (including track wheel gears) are fully enclosed and run in oil.

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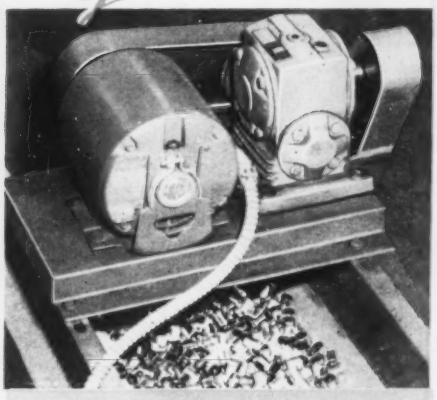
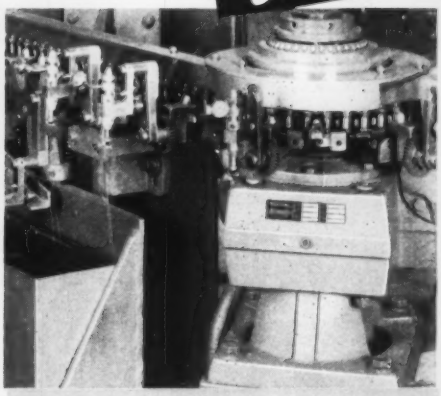
BOSTON GEAR Standardized Speed Reducers take top-rating in any test. Why pay more, — why wait, for "specials?"



LASTING POWER ECONOMY, long wear, easy maintenance and quiet operation make Boston Gear Speed Reducers the practical choice for drives in materials handling equipment. A 100 Series Model T Reductor is used in the conveyor drive illustrated, where production of 4,000,000 lamp bases per day requires continuous, trouble-free operation.



COST OF SPECIAL MACHINES IS MUCH LESS when designed around Boston Gear Standardized stock components. A 100 Series Model VMW Ratiomotor drives this automatic stripping and soldering machine for fuse plug lead wires. Assembly also includes standard stock Boston spur gears, rack, pillow blocks, pulleys, sheaves, and bushings.

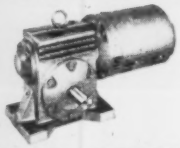
1605
TYPES and RATIOS
FROM STOCK

REDUCTORS

Ratios
1:1 to 3600:1
.004 to 50 HP

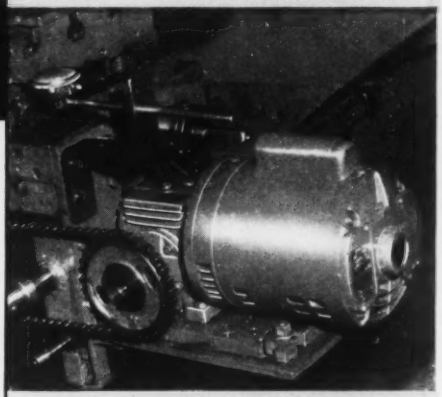
RATIOMOTORS

Output RPM .49 to 175



FLANGED REDUCTORS

Ratiomotor gear assemblies, sold without motor. You buy and attach your choice of motor.



INCREASED COOLING EFFICIENCY of the finned housings of Boston Gear Speed Reducers dissipates heat rapidly. This permits compact design and higher torque capacity, of special advantage in machine tool drives like the 100 Series Model M Ratiomotor illustrated, and where space is limited, or where high area temperatures prevail.

STANDARDIZED VARIABLE SPEED DRIVES, assembled from Boston Gear stock parts, simplify the design job, and save the time required to procure special equipment. The illustration shows a Boston Gear Variable Speed assembly with a Type TW Reductor, used with Boston stock sprockets and chain to drive conveyor belt of a heat-treating furnace.

Your nearby Boston Gear Distributor can furnish any model you need, *from stock.* His factory-trained specialists will advise you on selection to simplify design and assure maximum economy. Be cost-wise . . . STANDARDIZE and SAVE. Boston Gear Works, 73 Hayward St., Quincy 71, Mass.

Catalog No. 56 lists complete specifications — selection data

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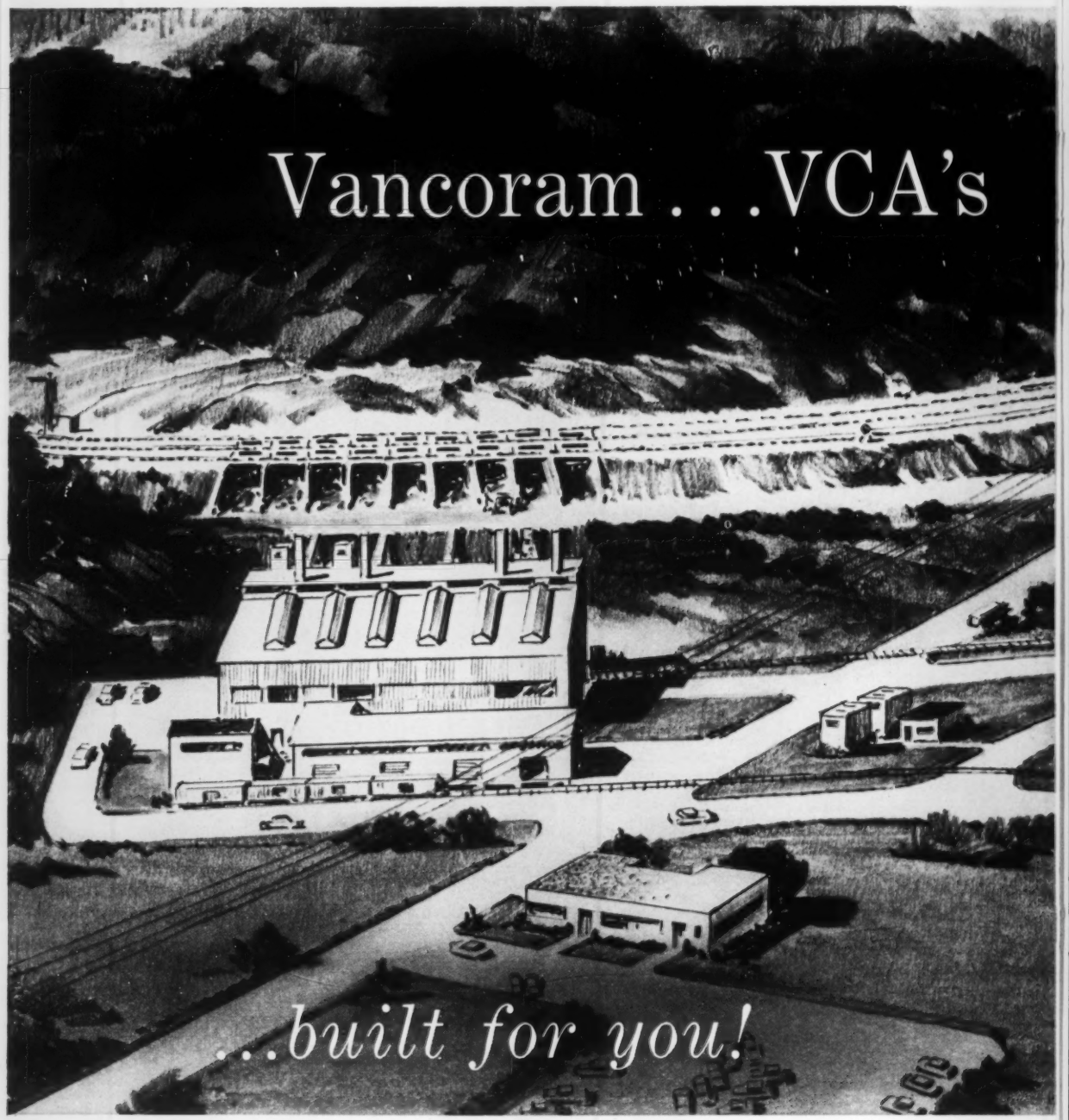
Box Score on Direct Reduction

(*Continued from Page* 182)

Process	Its Nature	Location	Reducing Agent	Type Product	Status	Remarks
Tysland-Hole	Electric arc furnace	Several in Scandinavia	Low grade coal with arc heat source	Pig iron	Production	Requires cheap electric power. Siemens furnace is similar.
Lubatti	Electric resistance furnace	Forni Lubatti Co., Turin, Italy	Coal	Pig iron	Production (?)	Fine ore reduced by coal fines in slag maintained molten by resistance heating.
Krupp-Renn (Johannsen)	Rotary kiln	Several in Europe, Asia, Africa	Low grade coal, or coke breeze	Iron nodules, sponge iron	Production	Product likely to be high in sulfur, silica, gangue. Basset kiln is similar.
R-N (Republic Steel-National Lead)	Rotary kiln	Birmingham	Low grade carbon fuel	Iron flake compacts	Semi-production	Employs a highly beneficiated charge.
Madaras	Fluidized bed	Longview, Tex.	Cracked natural gas	Sponge iron	Semi-production	A modified Madaras plant is making charge metal for a small Mexican steel company.
Nu-Iron (U. S. Steel)	Fluidized bed	South Works, Chicago	Hydrogen & carbon monoxide	Iron powder compacts	Pilot	Continuous process using natural gas source for reducing gases.
Esso-Little (Arthur D. Little)	Fluidized bed	Arthur D. Little Inc., Cambridge, Mass.	Hydrogen & carbon monoxide	Iron powder compacts	Pilot	Continuous process using natural gas source for reducing gases.
H-Iron (Hydrocarbon Research)	Fluidized bed	Hydrocarbon Research Inc., Trenton, N. J.	Hydrogen	Iron powder compacts	Semi-production	Alan Wood Steel Co. has ordered full scale plant.
Hoganas (Sieurin)	Tunnel kiln	Hoganas, Sweden; Riverton, N. J.	Coke or coal	Sponge iron	Production	Used mainly for iron powder production.
Domnarfvet	Rotary furnace	Domnarfvet, Sweden	Coke or coal	Sponge iron	Experimental	Operating problems similar to Krupp-Renn.
Diamond Alkali	Rotating drum	Battelle Memorial Institute, Columbus, Ohio	Coal	Liquid iron or steel	Experimental	Applications to direct reduction still theoretical.
Demag-Humbolt	Low shaft blast furnace	Germany	Coal	Pig iron	Production	One of many low shaft designs. Not competitive with coke blast furnace.
DLM (Dwight-Lloyd-McWane)	Sintering machine & shaft furnace	McDowell Co. Inc., Cleveland	Cheap coal or coke breeze	Pig iron	Experimental	Primarily a pellet roasting process.
Cyclosteel	Slagging cyclone with fluidized bed preheater	British Iron & Steel Research Assn., London	Cheap coal or natural gas & oxygen	Steel	Experimental	Several stage reduction with liquid end product.

(*Please turn to Page* 187)



America's stainless steel demands continue to grow. VCA helps meet the need for alloys with giant new plant at Vancoram, Ohio.

Stainless steel production in the U. S. has risen 34% since 1952, when VCA completed its Graham, W. Va., plant devoted to the production of chromium and silicon alloys. To meet America's growing appetite for alloy and stainless steels and irons, VCA is opening these two new plant units in Jefferson County, Ohio—with another unit to come! Products of the new plant will include high carbon ferrochromium, ferrochrome-silicon alloys and Vancoram EXLO®, an extra low carbon ferrochromium of highest purity, extensively used in the production of low carbon stainless.

With this expansion, VCA not only keeps pace with demand, but ahead of it, to assure you of a constant, plentiful and economical source for the alloys that make stainless steel stainless!

Be sure to visit Vancoram Booth #854, Metals Show, Chicago, Illinois, November 4-8

Newest Plant

This is Vancoram, Ohio. Here, on a 300-acre Jefferson County site, VCA produces chromium and silicon alloys essential to stainless steel production.

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VANADIUM CORPORATION OF AMERICA

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ROLOCK
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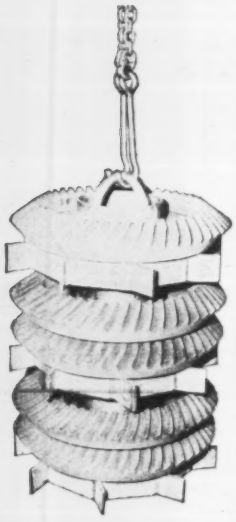
HEAT AND CORROSION RESISTANT

ROLOCK knows how to step up PIT-TYPE FURNACE EFFICIENCY



This BIG welded-fabricated fixture for processing heavy duty ring gears 28" in diameter is just an example of many hundreds of lift post fixtures built for use in pit-type furnaces. This fixture is held to 1670° F. for 12 hours in carburizing, then cooled to 1450° F. for 4 hours, then slowly air-cooled. It takes the place of a heavy casting.

Not only is this design relatively light in weight and hence economical in furnace time and fuel consumption, but it has proved exceptionally stable under the heavy load.

Rolock has become a major fabricator of a full range of pit-type furnace equipment adapted to the service requirements of all leading furnace makes . . . simply because Rolock designs and welded-fabrication know-how consistently reduce costs and help step up efficiency. Send us your next inquiry for recommendations and quote.

ROLOCK Pit-Type Furnace Equipment *includes:*

RETORTS
All sizes and for all makes of furnaces; incorporating ROLOCK's time-tested quality methods of fabrication.

GRIDS and SCREENS
Screens available immediately from stock in a range of standard sizes and mesh. Also ROLOCK's new pressure-welded, truss-type grids.

BASKETS
A wide range of standardized or special designs, including ROLOCK's new high efficiency "corrugated" construction.

FIXTURES
Often a special fixture will effect tremendous savings in handling parts. Let ROLOCK experience and facilities help you enjoy these economies.

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Easier Operation, Lower Cost

7RL57

DIRECT REDUCTION . . .

concentrate mixed with a carbon char derived from low grade, non-coking coal or coke breeze. The carbon charge is several times that theoretically required to reduce the ore.

The kiln is fired with an oxidizing flame, but with the excess carbon, reducing conditions in the charge are sufficient to produce 90 per cent reduction. The end product, highly saturated with carbon, is quenched in water and crushed. The uncombined carbon is returned to the kiln, and the metallic iron is separated from the gangue (probably by wet classification and magnetic separation) and then is put through a briquetting press.

Artificial Scrap—Republic says the R-N briquets have an iron content of 85 to 95 per cent and a silica content frequently under 1 per cent. High silica has been one of the objections to kiln reduction. By separating out most of the silica before putting the charge in the kiln, Republic probably gets away from a lot of the sticking and ring formation that have plagued kiln operators. About 90 per cent of the sulfur and phosphorus in the ore is rejected, too.

The briquets, in sizes up to 25 lb, can be used as the equivalent of No. 1 heavy scrap in open hearth and electric furnaces. A grade of lower iron content for blast furnace charging is also separated from the end product and is made up into peach-seed briquets.

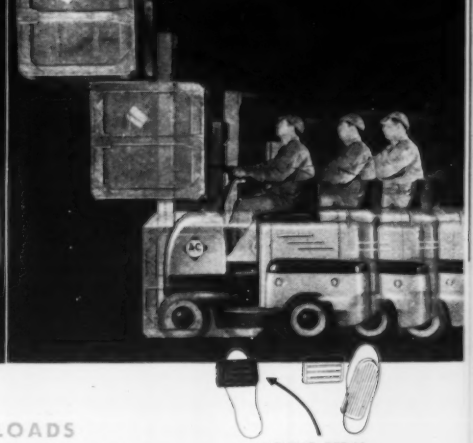
Long kilns are not the only kind that bear watching. (They have a long and checkered history, in which the numerous Krupp-Renn installations play the leading part.) Since the war, the Swedes have been trying stubbier rotating vessels with some success. Don't overlook the Diamond Alkali Reactor (STEEL, July 1, p. 74) as another possibility.

Electric Arc — Although used successfully in Scandinavia and other cheap power areas, the electric smelting furnace has never had much of a chance in this country. Tied in with ore beneficiation and partial reduction processes, it could make a breakthrough. Several processes can provide a partially reduced feed for an electric smelter, which can then accomplish the final refinement to molten pig

NEW ALLIS-CHALMERS POWER SHIFT

TORQUE CONVERTER DRIVE

Makes lift truck operation *easier than ever before!*



SIMPLE FLICK OF A LEVER CHANGES DIRECTION — *SMOOTHLY*

Just flip lever ahead for forward, back for reverse — with light finger-tip touch. You'll be surprised how fast and smoothly you change directions, without jerking. You work fast, stay fresh, get more done.

ENJOY *NEW* SAFETY OF OPERATION

Have full control — ALWAYS, with every move forward or reverse made under constant, positive power coupling. No coasting, no dangerous delay between power application and braking.

Brake to stop — merely release pedal to restart. Applying brake pedal, at left of accelerator, does not break power coupling. This saves time and effort stopping and starting.

There's additional safety in two new features: engine will not start while truck is in gear — and POWER SHIFT Drive automatically returns to neutral if operator leaves the seat.

POSITION LOADS QUICKLY, ACCURATELY WITH NEW INCHING CONTROL

Inching pedal lets you move fast or just creep, always under *full, positive* control. With this you also have *full engine power* for fast lifting, even while inching.

MULTIPLY WORK CAPACITY, INCREASE GRADABILITY WITH TORQUE CONVERTER DRIVE

The torque converter, on all Allis-Chalmers trucks with POWER SHIFT Drive, automatically matches power to load, multiplies working ability, increases gradability.

SIMPLICITY, RELIABILITY, TOO

POWER SHIFT Drive is simple to operate and service — dependable, too.

Get the complete story on how POWER SHIFT saves time, makes driving trucks easier, helps get more done. See your Allis-Chalmers material handling dealer . . . or write for Bulletin BU-465.

Here's new smoothness of operation — with more speed, less fatigue.

ALLIS-CHALMERS, MATERIAL HANDLING DEPT., BUDA DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

BH-59

Traveling fume hood follows the ladle...

for leaded steel production

AT JONES & LAUGHLIN STEEL CORP.

Toxic lead oxide fumes, inherent to the leaded steel manufacturing process, are now controlled effectively with a traveling hood car system (1), developed by KIRK & BLUM.

Orifice of exhaust system is just inches away from the pouring action (2). Toxic gas, formed in the ingot mold, is baffled by the ladle bottom, (3), to assist positive horizontal cross-flow at high velocity over the top of the molds.

The hood connects to a slotted exhaust manifold, (4), equipped with flexible sealing surfaces. Synchronized with the ladle crane, the car indexes freely along the pouring platform, opening the flexible sealing surfaces only at the point of contact to produce suction through the intake orifice for fume removal in the area of pouring.

This unique design is a product of KIRK & BLUM engineering ingenuity. Put this know-how to work for you. For further details or a no-obligation fume control survey, write: The Kirk & Blum Manufacturing Co., 3226 Forrer Street, Cincinnati 9, Ohio.

KIRK & BLUM
DUST AND FUME CONTROL

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Pittsburgh, Pa. Distributor
The Bushnell Machinery Co., 3015 West Liberty Avenue

DIRECT REDUCTION . . .

(or even steel) at a reasonable energy expenditure.

Certainly, electric smelting will have an inside track when cheap atomic power becomes available. In fact, any process which can make good use of conventional equipment is a big step ahead.

One that appears to fit this requirement is the Dwight - Lloyd-McWane process (McDowell Co. Inc., Cleveland). It would use a pelletizing machine and a sintering plant. both quite conventional.

Pellet Reduction—Pellets for the DLM process are formed from iron oxide and coal fines in excess of the carbon needed for reduction. They are spread on a sintering strand and ignited. Air is drawn through the bed of pellets and the blast continued until about 6 per cent carbon by weight remains in the charge. At this point the oxides are perhaps 40 per cent reduced, and the carbon undergoes a transformation to graphite which binds the pellet materials together.

The partially reduced pellets are charged to a smelting furnace (the original idea seems to have been a shaft furnace, but an electric smelter would probably do as well). Coke and flux stone are added as needed to complete the reduction to molten pig suitable for open hearth charging.

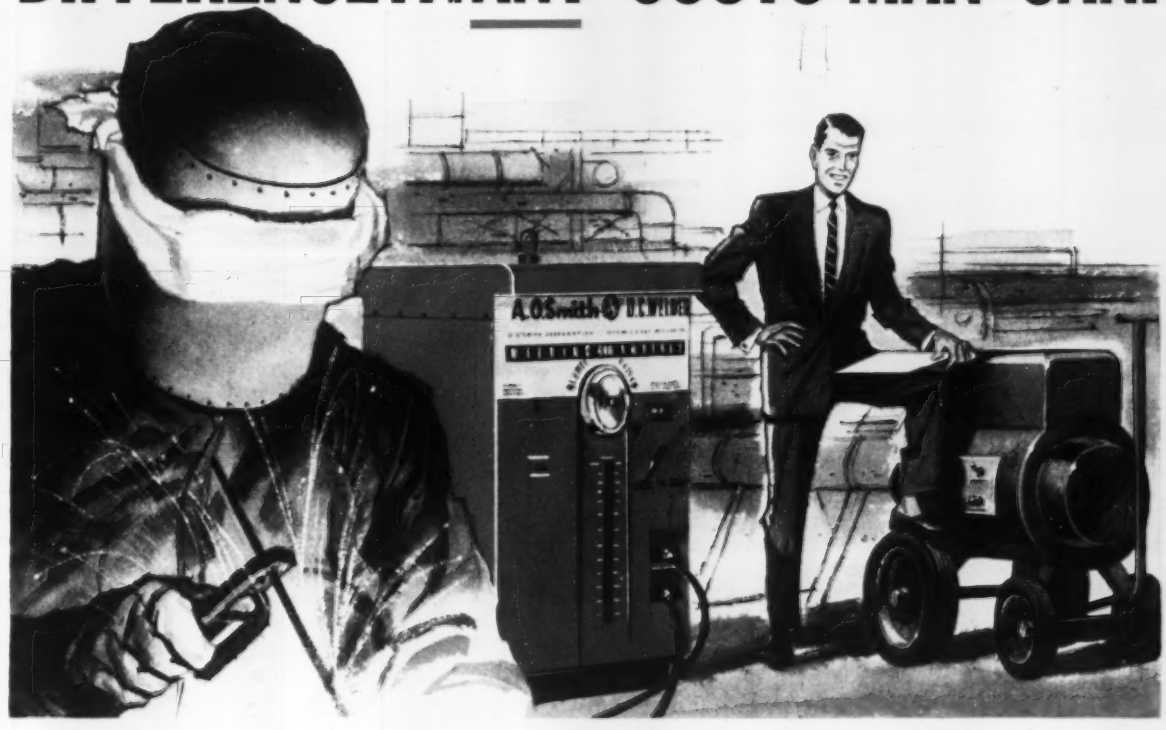
Shaft Furnaces — The low and medium shaft smelting furnaces all bear a kinship to the blast furnace; they get away from the cost of coke ovens by using low-grade, carbonaceous fuel. Being of low crushing strength, such a charge makes a high shaft impossible.

The feeling seems to be that our fuel situation is not bad enough to make the low shaft blast furnace of any use in the American economy. There are plenty of working examples to rely on (including an international test furnace at Liege, Belgium) if they are ever to make an appearance here.

Fluidized Bed—Taking their cue from the catalytic crackers of the oil industry, several companies are working with fluidized bed plants. Powdered ore is reacted with a reducing gas in a closed vessel under conditions which cause the ore particles to act like a fluid. A maximum amount of their surface is

In a comparison of A. O. Smith D-C rectifiers vs. M-G sets...

MOST WELDERS CAN'T TELL THE DIFFERENCE...ANY "COSTS MAN" CAN!



THERE'S LITTLE DIFFERENCE IN ARC ADJUSTMENT CHARACTERISTICS BETWEEN A. O. SMITH D-C RECTIFIERS AND M-G SETS — and a blind-fold test will prove it! With its arc booster arrangement, an A. O. Smith d-c rectifier can provide any of four characteristics at the flip of a switch — *booster on* for fast striking... *booster off* for quick work on routine jobs ..*smooth arc* for perfect welds on light gauges... and *forcing arc* for deep penetration. In effect, an A. O. Smith d-c rectifier provides most of the arc adjustments previously possible only with m-g sets.

A. O. SMITH D-C RECTIFIERS COST FAR LESS TO MAINTAIN THAN M-G SETS — no commutators, brushes, wires or bearings to wear and need replacement. No frequent inspections and lubrication. In a matter of months any costs man can tell there's a big difference in operating economy in favor of the A. O. Smith d-c rectifier.

Your man from A. O. Smith will be pleased to arrange a demonstration. Contact him now. Or write direct for information.

A. O. Smith rectifiers are available in quality built 200, 300, 400, 600, 800, 1000 and 1250-amp models. Larger models for power applications may be had in up to almost any rating.

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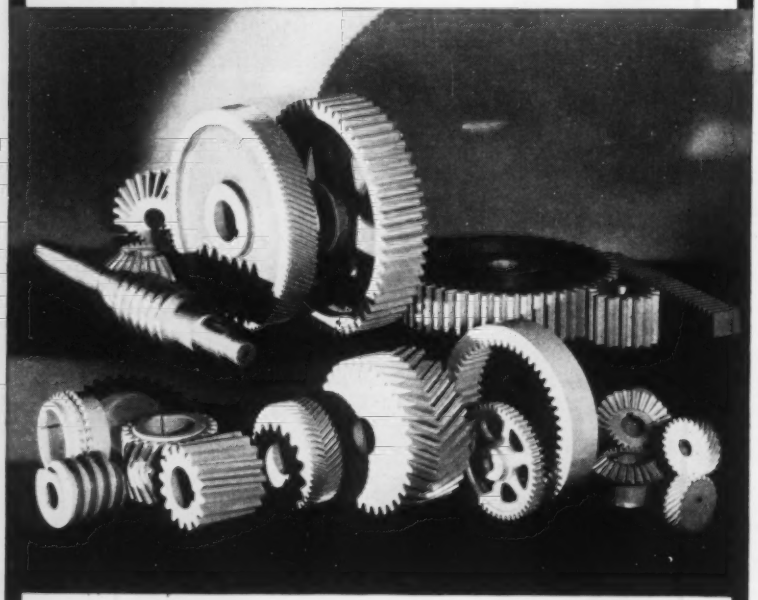
One of these **9**

H & S Gears

is sure to answer your power transmission needs!



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Regardless of type, every H & S Gear is of the rugged, "husky" type. Heavy rims are well reinforced. Hubs are heavy in section, eliminating the need for key patches. All sharp corners are broken and generous fillets are provided.

H & S Gears are available of Steel, Hardened Steel, Alloys, Cast Iron, Bronze, Rawhide, Fibroil, or Bakelite.

Exacting care is exercised in every manufacturing step of H & S Gears. This insures *quietness of operation, uniform velocity ratio,* and *freedom from vibration.*

Whether you need a gear that weighs one ounce or 10 tons, why not put our years of gear engineering experience to work for you. Just send us the specifications or call. There's no obligation.

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DIRECT REDUCTION . . .

exposed to reducing gas, and the particles can be made to flow from one vessel to another, making the processes theoretically continuous.

Best publicized is the H-iron process (Hydrocarbon Research Inc. and Bethlehem Steel Co.) which uses pure hydrogen at 900° F and 400 psi as the reducing agent. The Nu-Iron process (U. S. Steel Corp.) is said to reduce with a combination of hydrogen and carbon monoxide at about 1300° F and 50 psi. The Esso-Little process (Arthur D. Little Inc.) operates with a mixture of hydrogen, carbon monoxide, and nitrogen at atmospheric pressure and 1600° F.

Each depends on cheap hydrogen or cheap natural gas for its reducing atmosphere and produces a synthetic scrap. We can assume that some of the problems that plagued earlier fluid bed processes have been solved, such as sticking in the vessel and a pyrophoric end product. H-iron ought to be about ready for a full scale trial. It has already created so much interest that the name may become generic.

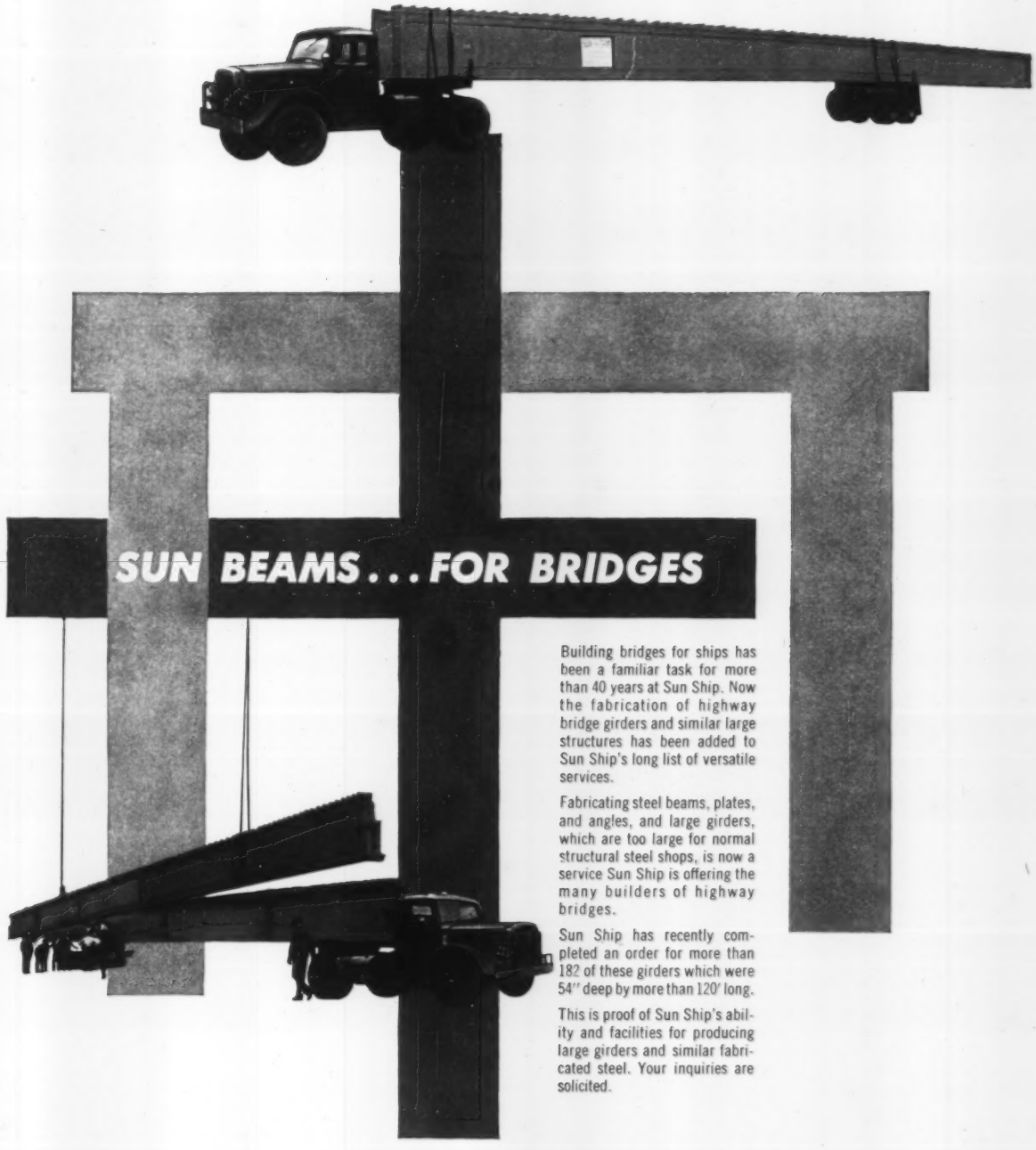
Phenomenon — The Cyclosteel process (British Iron & Steel Research Assn.) is another good example of the emotional appeal of direct reduction. It has attracted international attention on the basis of almost no facts. Perhaps what intrigues people is the report that it can take in ore at one end and turn out steel at the other.

The same claim has been made for other processes.

Summing Up — What is much more surprising is that so many people seem bent on ignoring the economic facts. These processes will have to provide hundreds of tons of iron or steel on a trouble-free, round the clock basis. They will have to compete with that established, versatile workhorse, the blast furnace (and it isn't going to stand still). They will have to do it for a cheaper installed cost and eventually for a cheaper operating cost.

Until that time arrives, theory can go stand in the corner.

• *An extra copy of this article is available until supply is exhausted. Write Editorial Service,* STEEL, *Penton Bldg., Cleveland 13, Ohio.*



SUN BEAMS . . . FOR BRIDGES

Building bridges for ships has been a familiar task for more than 40 years at Sun Ship. Now the fabrication of highway bridge girders and similar large structures has been added to Sun Ship's long list of versatile services.

Fabricating steel beams, plates, and angles, and large girders, which are too large for normal structural steel shops, is now a service Sun Ship is offering the many builders of highway bridges.

Sun Ship has recently completed an order for more than 182 of these girders which were 54″ deep by more than 120′ long.

This is proof of Sun Ship's ability and facilities for producing large girders and similar fabricated steel. Your inquiries are solicited.

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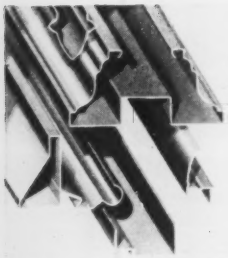
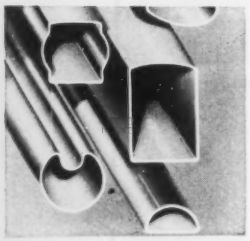
simplify design, increase production, reduce cost!

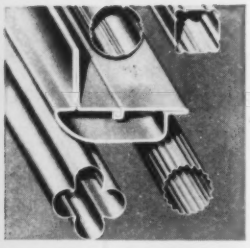
Look at the variety and versatility of these shapes, then take a closer look at your product. Maybe it could be made faster, better and at a lower cost with Van Huffel shapes . . . roller die, cold formed to any lengths from a wide variety of metals: hot or cold rolled steel, stainless steel, high strength steels, coated steels, copper, brass, aluminum, etc., from coiled strip ½" to 33" wide; in gauges from .003 to .312; from forming dies designed and built in our own plant. Consider, too, the advantages of using Van Huffel's complete fabricating services which include notching, bending, punching, tapering, flanging, beading, etc.



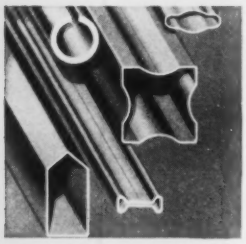
SPECIAL SHAPES



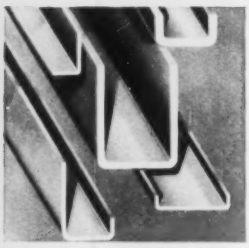
WELDED TUBING



LOCK SEAM TUBING



TIGHT & OPEN SEAM



ANGLES & CHANNELS

Typical ideas that have taken shape in metal for a variety of industrial applications

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39th National Metal Exposition and Congress

CHICAGO

PROGRAM

2nd World Metallurgical Congress

AMERICAN SOCIETY FOR METALS

Liquid Metals and Solidification Seminar

Saturday, Nov. 2—9 a.m.

Red Lacquer Room, Palmer House

Theory and Structure of Liquids—G. Vineyard, Brookhaven National Laboratory.

Properties of Liquid Metals—N. H. Nachtrieb, University of Chicago.

Thermodynamics and Properties of Liquid Solutions—O. J. Kleppa, University of Chicago.

G. M. Young, President

C. H. Lorig, Vice President

Saturday, Nov. 2—2 p.m.

Nucleation—E. M. Pound, Carnegie Institute of Technology.

Solid-Liquid Reactions—J. Weeks and D. H. Gurinsky, Brookhaven National Laboratory.

Mechanism of Metal Electrodeposition—J. O'M. Bockris, University of Pennsylvania.

Sunday, Nov. 3—9 a.m.

Ballroom, Palmer House

Mechanism of Crystal Growth—K. A. Jackson, Harvard University.

Thermal Considerations in Freezing—C. M. Adams Jr., Massachusetts Institute of Technology.

Solute Redistribution During Freezing—William G. Pfann, Bell Telephone Laboratories.

Sunday, Nov. 3—2 p.m.

Imperfections Resulting from Solidification—John Rutter, General Electric Research Laboratory.

Polyphase Solidification—William A. Tiller, Westinghouse Research Laboratory.

Structure of Ingots and Castings—J. Walker, General Electric Research Laboratory.

Sunday, Nov. 3—8 p.m.

A PREVIEW OF TOMORROW'S METALLURGY

Palmer House

(First Plenary Session)

Mineral and Energy Resources of the Free World—John Reedman, United Nations Organization.

1 Water-cooled power cables.

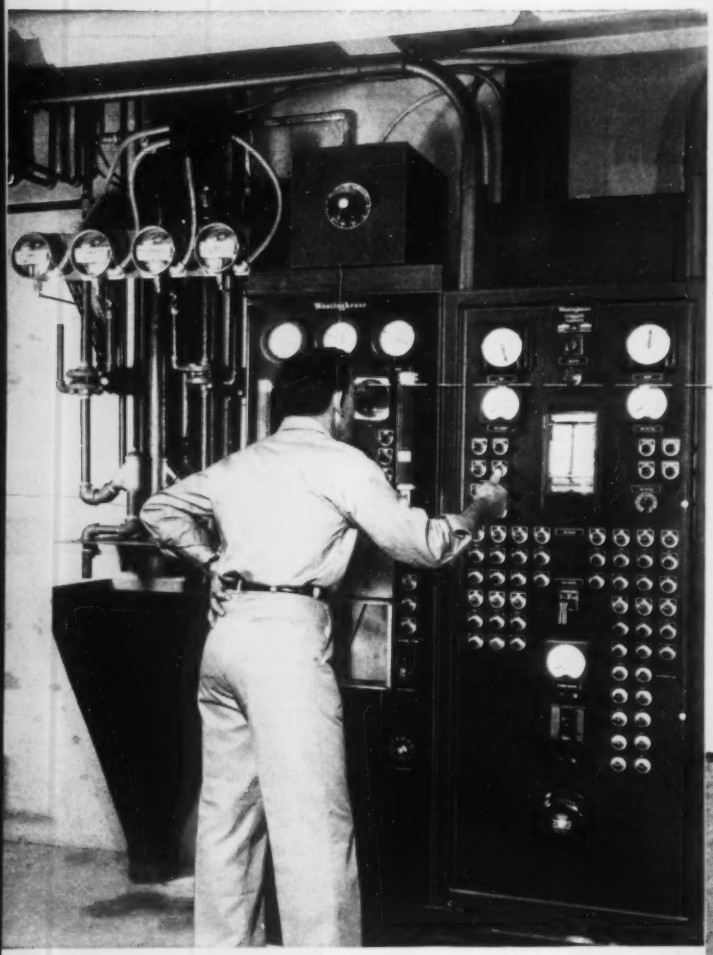
2 Electrode holder.

3 Vacuum-tight seal for electrode housing.

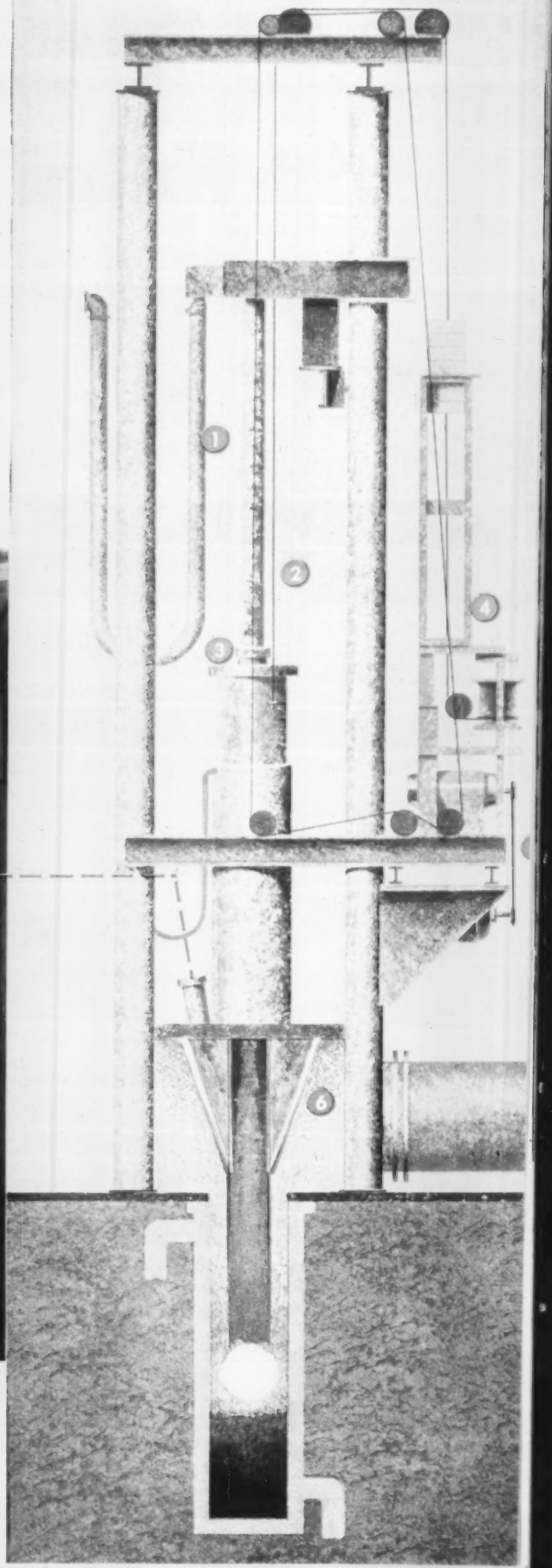
4 Lifting mechanism for electrode housing.

5 Automatic electrode position drive.

6 Electrode guides.



Automatic control panel sequences and monitors vacuum arc furnace operation. Built-in optical system allows operator to observe melting progress.



Westinghouse installs largest vacuum arc furnace at Carborundum Metals Company

Tough requirements for melting large, zirconium ingots have been minimized at Carborundum Metals Company by a new Westinghouse vacuum arc furnace. This furnace produces 8″ or 12″ first-melt ingots and 12″ or 16″ double-melt ingots up to 2200 lbs. Top metallurgical functioning results from careful design and construction.

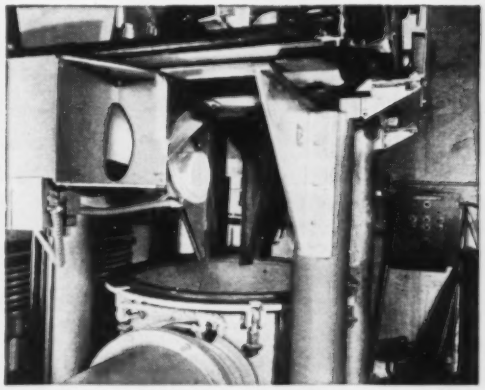
Furnace design is backed by extensive vacuum chamber research. This work developed methods for controlling the action of an arc in high vacuum. At Westinghouse Metals Pilot Plant these laboratory conclusions were scaled-up in production size melts. Ingot analysis verified furnace design and operating procedure.

Careful attention was given to electrical and mechanical components, too. Power cables are permanently connected for positive electrical contact. Electrode movement is governed by positive downward drive, and a positioning mechanism guides the electrode on true center. All drive components are externally mounted for easy inspection.

Capable of every step from research to equipment manufacturing, Westinghouse can be a single source for *your* vacuum metallurgy needs. It's another example of the way Westinghouse helps you POWER-UP . . . to get better production and profit from your electrical dollar. Talk it over with your Westinghouse Industrial Heating representative or write Westinghouse Electric Corporation, Industrial Heating Division, Meadville, Pa.

All furnace and atmosphere generator sales in the international market are handled by Westinghouse Electric International Company.

J-10465R



Accurate electrode centering is maintained by fixed guides; sound construction provides added safety.

Sturdy ingot molds, ranging from 8 to 16 inches in diameter afford simple installation . . . large cooling water connections . . . arc stabilization connections.

YOU CAN BE SURE...IF IT'S

Westinghouse

ASM PROGRAM . . .

Future of Iron and Steelmaking — Sven G. E. Fornander, Surahammars Bruks A. B., Sweden.

Future of Nonferrous Metallurgy—Francis C. Frary, Aluminum Co. of America.

Future Fabrication Techniques — Manuel C. Sanz, North American Aviation Inc.

Future of Heat Treatment — Otto Schaaber, Bremen, St. Magnus, Germany.

Role of the Metal Engineer in Nuclear Power—R. A. Skinner, A.E.I. —John Thompson Nuclear Energy Co. Ltd., England.

Summary — Zay Jeffries, Director General, 2nd World Metallurgical Congress.

TECHNICAL PAPERS

Monday, Nov. 4—9 a.m.

STEEL I

Ballroom, Palmer House

Presiding Officers—D. J. Carney, U. S. Steel Corp., Morris Cohen, Massachusetts Institute of Technology.

Electrolytic Extraction of Carbides from Carbon Steel—R. W. Gurry, Quaker Chemical Co., J. Christakos, W. M. Kellogg Co.; C. D. Stricker, American Steel & Wire Div., U. S. Steel Corp.

Transformation Structures in Hypoeutectoid Alloy Steels—W. C. Hagel and M. N. Ruoff, General Electric Co.

Effect of Manganese on the Curie Point of Cementite—Prof. Earl C. Roberts, University of Washington.

Morphological and Phase Changes During Quench-Aging of Ferrite Containing Carbon and Nitrogen—G. Lagerberg, Stora Kopparbergs Bergslags Aktiebolag, Domnarvet, Sweden; B. S. Lement, Massachusetts Institute of Technology.

Some Relationship Between Torsional Strength and Electron Microstructure in a High Carbon Steel—S. T. Ross, R. P. Sernka, and Walter E. Jominy, Chrysler Corp.

ZIRCONIUM

Red Lacquer Room, Palmer House

Presiding Officers—J. H. Bechtold, Westinghouse Electric Corp.; J. L. Wyatt, Horizons Inc.

Powder Metallurgy of Zirconium-Uranium Alloys—Herbert S. Kalish, Sylvania Electric Products Inc.

A Hot-Hardness Survey of the Zirconium-Uranium System — W. Chubb, Battelle Memorial Institute; G. T. Muehlenkamp, General Electric Co.; A. D. Schwope, Clevite Research Center.

Transformation Kinetics of Zirconium-Uranium Alloys—D. L. Douglass, L. L. March, G. K. Manning, Battelle Memorial Institute.

Transformation Kinetics and Mechanical Properties of Zr-Ti and Zr-Sn Alloys—R. F. Domagala, D. W. Levinson, and D. J. McPherson, Armour Research Foundation of Illinois Institute of Technology.

Monday, Nov. 4—2 p.m.

STEEL II

Ballroom, Palmer House

Presiding Officers—G. H. Enzian, Jones & Laughlin Steel Corp.; R. A. Grange, U. S. Steel Corp.

Some Aspects of the Morphology and Chemistry of Lead in Leaded High Sulfur Steels—J. W. Thurman and E. J. Paliwoda, Jones & Laughlin Steel Corp.; E. J. Duwell, Minnesota Mining & Mfg. Co.

Distribution of Residual Stresses in Carburized Cases and Their Origin —D. P. Koistinen, General Motors Corp.

Effect of Per Cent Tempered Martensite on Endurance Limit—F. Borik, R. D. Chapman, and W. E. Jominy, Chrysler Corp.

The Machinability of Type A Leaded Steels—E. J. Paliwoda, Jones & Laughlin Steel Corp.

TITANIUM

Red Lacquer Room, Palmer House

Presiding Officers—G. W. Birdsall, Reynolds Metals Co.; E. M. Mahla, E. I. du Pont de Nemours & Co.

Grain Growth and Recrystallization Studies on Commercial Titanium, RC-55, and Alloy, Ti-100A—Prof. E. L. Bartholomew, University of Connecticut.

Mechanical Properties and Heat Treatment of Titanium-Niobium Alloys—L. W. Berger, D. N. Williams, and R. I. Jaffee, Battelle Memorial Institute.

Evaluation of a New Titanium-Base Sheet Alloy, Ti-4Al-3Mo-1V—R. S. Richards, D. L. Day, and H. D. Kessler, Titanium Metals Corp. of America.

Mechanical Properties Correlated with Transformation Characteristics of Titanium-Vanadium Alloys—E. L. Harmon, A. R. Troiano, Case Institute of Technology; J. Kozol, Combustion Engineering Inc.

Factors Affecting the Absorption and Distribution of Hydrogen in Titanium During Acid Pickling—C. R. McKinsey, M. Stern, and R. A. Perkins, Electro Metallurgical Co.

The Mode of Hydride Precipitation in Alpha Titanium and Alpha Titanium Alloys—Tien-Shih Liu, Titanium Metals Corp.; M. A. Steinberg, Horizons Inc.

Tuesday, Nov. 5—9 a.m.

MECHANICAL PROPERTIES OF STEEL

Crystal Room, Palmer House

Presiding Officers—D. J. Girardi, Timken Roller Bearing Co.; W. T. Lankford, U. S. Steel Corp.

Strain Hardening of Austenitic Stainless Steel—G. W. Powell, Nuclear Metals Inc.; Prof. E. R. Marshall, University of Vermont; and W. A. Backofen, Massachusetts Institute of Technology.

The Effect of Rate of Stress Application and Temperature on the Upper Yield Stress of Annealed Mild Steel —J. A. Hendrickson and Prof. D. S. Wood, California Institute of Technology.

Some Aspects of Preyield Phenomena in Mild Steel at Low Temperatures —W. S. Owen, Morris Cohen, and B. L. Averbach, Massachusetts Institute of Technology.

The Energy Stored in Ingot Iron Deformed by Torsion at 25° C, −82° C, and −185° C—T. P. Wang, Wilbur B. Driver Co.; Prof. Norman Brown, University of Pennslvania.

METALLOGRAPHY

Ballroom, Palmer House

Presiding Officers—J. F. Libsch, Lehigh University; W. A. Reich, General Electric Co.

Classification of Precipitation Systems—R. O. Williams, Cincinnati Milling Machine Co.

A Method for the Etching of Metals by Gas Ion Bombardment—John B. Newkirk and W. G. Martin, General Electric Research Laboratory.

The Relation Between Constitution and Ultimate Grain Size in Aluminum—1.25 per cent Manganese Alloy 3003—Philip R. Sperry, Kaiser Aluminum & Chemical Corp.

The Occurrence of Laves-Type Phases Among Transition Elements—R. P. Elliott and W. Rostoker, Armour Research Foundation of Illinois Institute of Technology.

Tuesday, Nov. 5—2 p.m.

BRITTLE FRACTURE

Red Lacquer Room, Palmer House

Presiding Officers—J. E. Dorn, University of California, Richard Vanderbeck, U. S. Steel Corp.

Brittle Fracture of Mild Steel in Tension at −196° C—W. S. Owen, Morris Cohen, and B. L. Averbach, Massachusetts Institute of Technology.

The Initiation of Brittle Fracture in Mild Steel—J. A. Hendrickson, Prof. D. S. Wood, and D. S. Clark, California Institute of Technology.

A Study of the Role of Carbon in Temper Embrittlement—E. B. Mikus, General Motors Research Staff, and Prof. C. A. Siebert, University of Michigan.

Brittle to Ductile Transition Temperatures of Binary Chromium Base Alloys—E. P. Abrahamson II, and Prof. N. J. Grant, Massachusetts Institute of Technology.

Wednesday, Nov. 6—10 a.m.

Palmer House

Campbell Memorial Lecture—Modern Concepts of Flow & Fracture—E. R. Parker, University of Calif.

Wednesday, Nov. 6—2 p.m.

STAINLESS STEEL

Red Lacquer Room, Palmer House

Presiding Officers—G. A. Fritzlen, Haynes Stellite Co., P. G. Nelson, Budd Co.

Effect of Microstructure and Heat Treatment on the Mechanical Properties of AISI Type 431 Stainless Steel—G. E. Dieter, E. I. du Pont de Nemours & Co.

Effect of Aging Cycle on the Properties of an Iron Base Alloy Hardened with Titanium—T. W. Eichelberger, Westinghouse Electric Corp.

Influence of Nickel on Intergranular Corrosion of 18 per cent Chromium Steels—J. R. Upp, Wright Air Development Center, Wright-Patterson Air Force Base, and Profs. F. H. Beck and M. G. Fontana, Ohio State University.

Phase Relationships in Austenitic Cr-Mn-C-N Stainless Steels—C. M. Hsiao and E. J. Dulis, Crucible Steel Co. of America.

Carbide Precipitation and Brittleness in Austenitic Stainless Steel—A. Kramer and Prof. W. M. Baldwin Jr., Case Institute of Technology.

Thursday, Nov. 7—9 a.m.

MECHANICAL PROPERTIES

Red Lacquer Room, Palmer House

Presiding Officers—R. W. Guard, General Electric Co.; H. Y. Hunsicker, Aluminum Co. of America.

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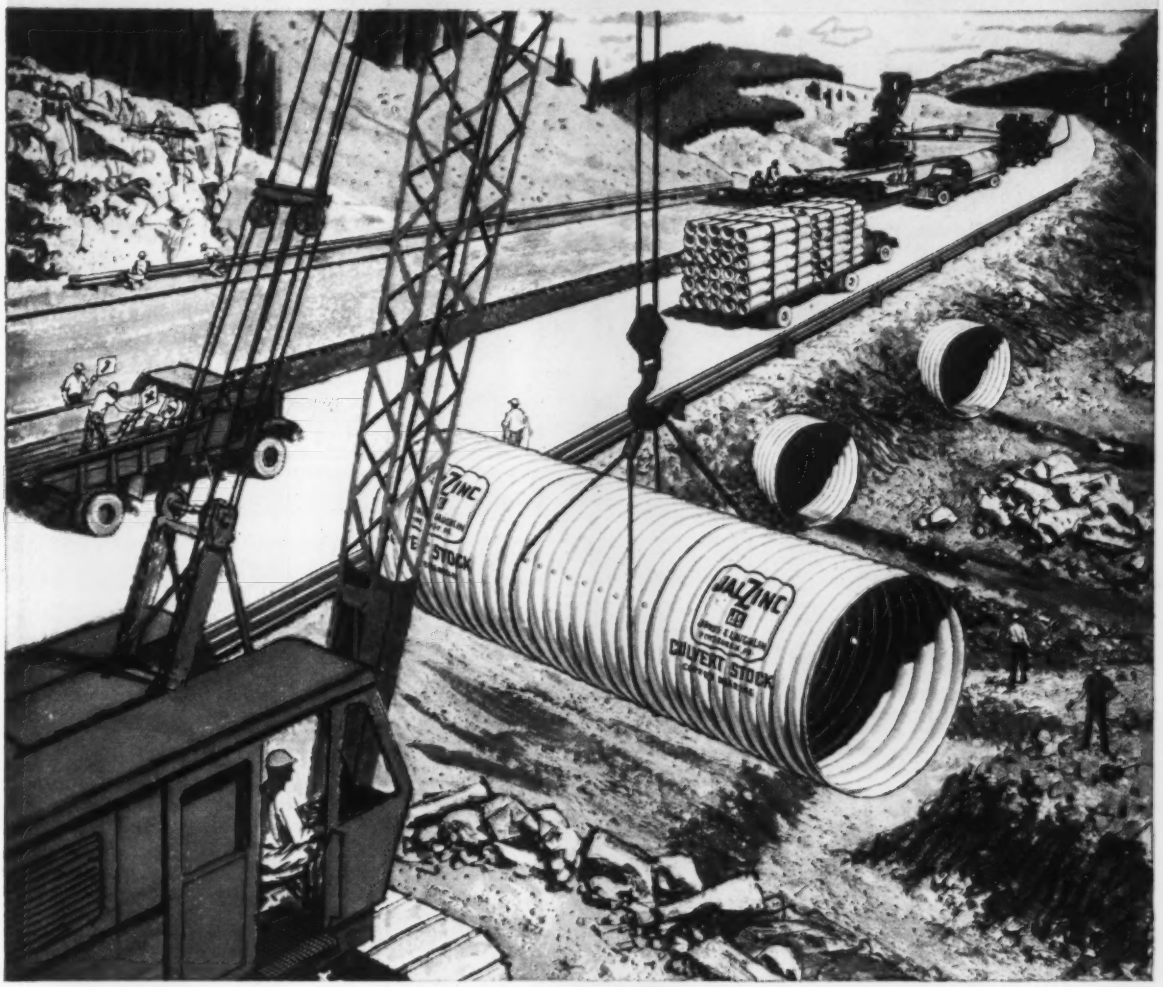

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ASM PROGRAM . . .

Effects of Temperature-Time Histories on the Tensile Properties of Airframe Structural Aluminum Alloys—R. E. Fortney and C. H. Avery, Northrop Aircraft.

Apparatus for Determining the Hardness of Metals at Temperatures up to 3000° F—M. Semchyshen and C. S. Torgerson, Climax Molybdenum Co. of Michigan.

The Mechanical Properties of Forged Chromium—S. A. Spachner and W. Rostoker, Armour Research Foundation of Illinois Institute of Technology.

Deformation and Fracture of Alpha Solid Solutions of Lithium in Magnesium—F. E. Hauser, P. R. Landon, and Prof. John E. Dorn, University of California.

THERMAL CYCLING OF URANIUM
Ballroom, Palmer House

Presiding Officers—H. H. Chiswik, Argonne National Laboratory; W. D. Manly, Oak Ridge National Laboratory.

Some Properties of Uranium-Low Titanium Alloys—Prof. Daniel J. Murphy, University of Arizona.

Effects of Fabrication and Heat Treatment Variables Upon the Thermal Cycling Behavior of Uranium—S. T. Zegler, R. M. Mayfield, and M. H. Mueller, Argonne National Laboratory.

Effects of Cycling Variables Upon Growth Rate of 300° C Rolled Uranium—R. M. Mayfield, Argonne National Laboratory.

The Growth of Uranium Upon Thermal Cycling—J. E. Burke and A. M. Turkalo, General Electric Co.

Microstructural Changes of Uranium Upon Thermal Cycling—L. T. Lloyd and R. M. Mayfield, Argonne National Laboratory.

JOINT SESSION, POWDER METALLURGY
Palmer House

Thursday, Nov. 7—2 p.m.
PHYSICAL METALLURGY
Red Lacquer Room, Palmer House

Presiding Officers—R. F. Hehemann, Case Institute of Technology; R. I. Jaffee, Battelle Memorial Institute.

Grain Boundary Movement in Bicrystalline Aluminum—Prof. R. B. Pond and E. Harrison, Johns Hopkins University.

Growth of Cadmium from the Vapor—J. E. McNutt, E. I. du Pont de Nemours & Co.; R. F. Mehl, Carnegie Institute of Technology.

Grain Boundary Self-Diffusion of Nickel—Prof. W. R. Upthegrove, University of Oklahoma; M. J. Sinnott, University of Michigan.

The Effects of Oxide Recrystallization on the Oxidation Kinetics of a 62:38 Copper-Nickel Alloy—J. A. Sartell, S. Bendel, T. L. Johnston, and C. H. Li, Minneapolis-Honeywell Research Center.

Temperature Stresses in the Two-Phase Alloy, WC-Co—Prof. J. Gurland, Brown University.

INTERNATIONAL PANEL DISCUSSIONS

(2nd World Metallurgical Conference)
All at Hotel Sherman

Monday, Nov. 4—9 a.m.
CARBURIZING
Louis XVI Room

Moderator—Walter Holcroft, Holcroft & Co.

SHIP WELDING
Crystal Room

Moderator—D. P. Brown, president, American Bureau of Shipping.

Monday, Nov. 4—2 p.m.
ELECTRODES
Crystal Room

Moderator—D. C. Smith, Harnischfeger Corp.

MINIMIZING DISTORTION
Louis XVI Room

Moderator—H. N. Bosworth, H. M. Bosworth Steel Treating Co.

Tuesday, Nov. 5—9 a.m.
STEEL GEARS
Crystal Room

Moderator—M. F. Garwood, Chrysler Corp.
Selection of Steel for Gears.
Fabrication of Gears.
Operation (Testing, proper mounting, stresses, etc.)

Tuesday, Nov. 5—2 p.m.
SELECTION OF SHEET STEEL for FORMABILITY
Crystal Room

Moderator—R. W. E. Leiter, Budd Co.

STRESS RELIEVING and PREHEATING (Welding)
Louis XVI Room

Moderator—Leon Bibber, U. S. Steel Corp.

Wednesday, Nov. 6—2 p.m.
CONTINUOUS CASTING
Louis XVI Room

Moderator—Carl E. Swartz, Consultant.

MACHINING OF STEEL
Crystal Room

Approach to the Problem of Machinability—M. E. Merchant, Cincinnati Milling Machine Co., Cincinnati.

Microstructure as Related to Machinability of Common Constructional Steels—Arthur H. Smith, Cadillac Motor Div., General Motors Corp., Detroit.

Effect of Composition of Constructional Steel on Machinability—L. W. Derry, Battersea Polytechnic, London, England.

Effect of Composition of Constructional Steel on Machinability—G. R. Caskey, Bliss & Laughlin Inc., Harvey, Ill.

Thursday, Nov. 7—9 a.m.
STEELMAKING AND REFINING

IRON
Bal Tabarin Room

Moderator—R. L. Stephenson, U. S. Steel Corp.
Present Technology of Ironmaking.
Developments in Ironmaking.
Direct Reduction of Iron.

PRACTICAL ASPECTS of METAL DEGASSING
Assembly Room

Moderator—Albert J. Phillips, American Smelting & Refining Co.

EDUCATION AND RESEARCH
George Bernard Shaw Room

Physical Metallurgy — Tokuschichi Mishima, Tokyo, Japan, and Thomas A. Read, University of Illinois.

Process Metallurgy—G. Letendre; Laval University, Quebec, P.Q., Canada, and W. O. Philbrook, Carnegie Institute of Technology, Pittsburgh.

Graduate Work—Earl R. Parker, University of California, Berkeley.

Industrial Training—Harry Smith, U. S. Steel Corp., Pittsburgh.

Thursday, Nov. 7—2 p.m.
STEELMAKING
Bal Tabarin Room

Moderator—Howard Jones, Jones & Laughlin Steel Corp.

Oxygen in Steelmaking—Sven G. E. Fornander, Surahammars Bruks AB, Sweden, and Harold B. Emerich, Jones & Laughlin Steel Corp., Pittsburgh.

Vacuum Melting—Otto Winkler, Balzers, Geraetebau-Anstalt, Furstentum, Idechtenstein, and James H. Moore, Metal Hydrides Inc., Beverly, Mass.

Vacuum Degassing—Fritz Harders, Dortmund-Horder Huttenunion AG, Dortmund, Germany, and E. C. Bain, U. S. Steel Corp., Pittsburgh.

TESTING in PRODUCT DEVELOPMENT
Crystal Room

Co-Moderators—H. N. Bogart, Ford Motor Co., G. W. Stickley, Aluminum Co. of America.

Large Components—Low Volume Production
(Examples: Turbine shafts for power stations or marine engines).

Medium Size Components—Moderate Volume Production.
(Example: Aircraft components).

Medium and Small Components—Large Volume Production
(Example: Automotive components).

TRENDS in METALLURGICAL RESEARCH IN AMERICA
George Bernard Shaw Room

Moderator—Clyde L. Williams, Battelle Memorial Institute.

Industrial Research—Ivor Jenkins, Research Laboratories, General Electric Co., Ltd., Wembley, Middlesex, England, and E. C. Bain, U. S. Steel Corp., Pittsburgh.

Government and Government-Sponsored Research—N. P. Allen, Metallurgy Division, National Physical Laboratory, Teddington, Middlesex, England, and Julius Harwood, Office of Naval Research, Washington, D. C.

Institutes and Research Consultant Groups—E. A. G. Liddiard, Fulmer Research Institute, Stoke Poges, Bucks, England, and Bruce Old, Arthur D. Little Inc., Cambridge, Mass.

University Research—Hans Nowotny, Technische Hochschule, Vienna, Austria, and R. F. Mehl, Carnegie Institute of Technology, Pittsburgh.

Friday, Nov. 8—9 a.m.
SOLIDIFICATION of STEEL
Bal Tabarin Room

Moderator—C. W. Sherman, Latrobe Steel Co.
Ingot Technology.
Controlled Nucleation.
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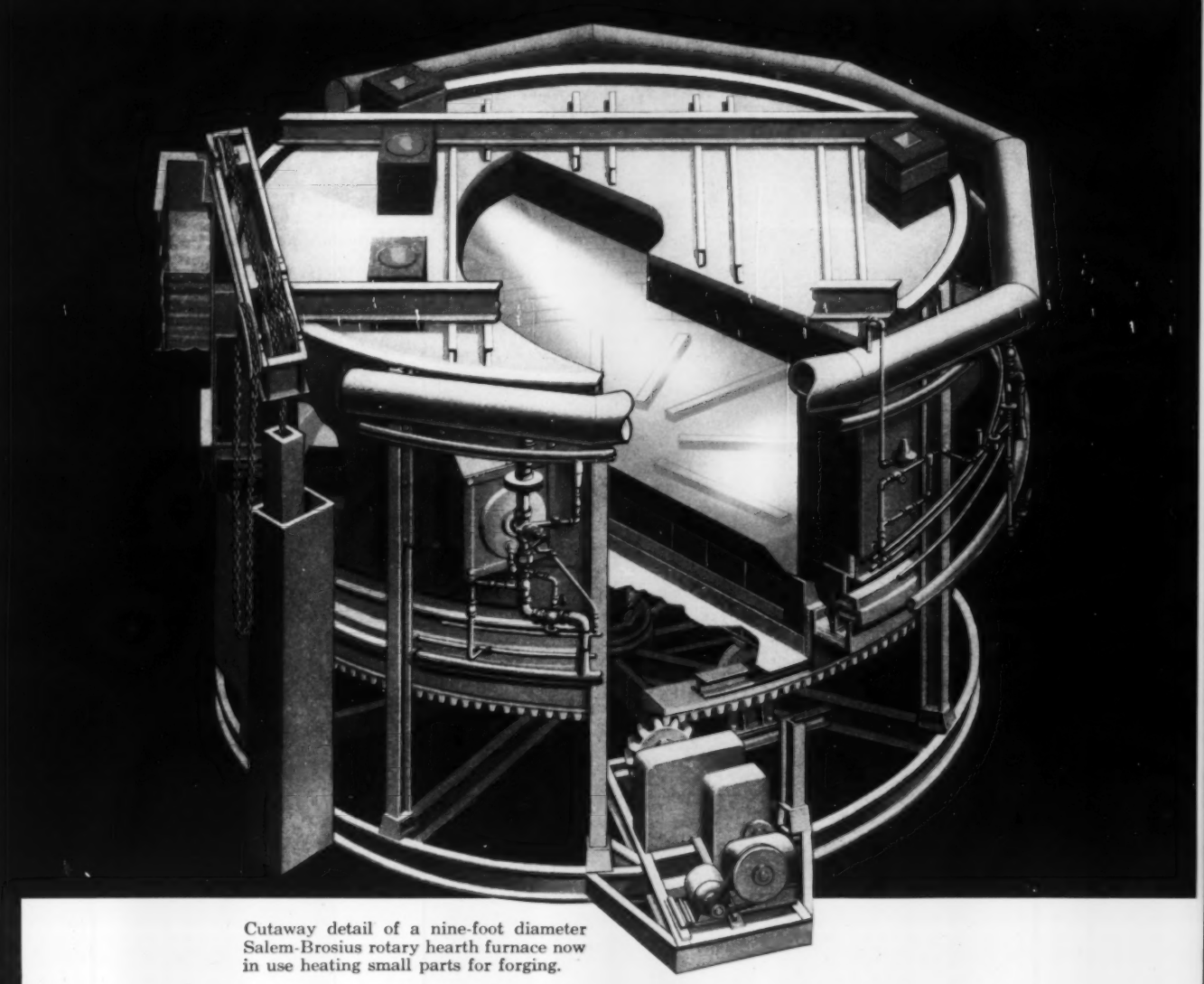

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ASM PROGRAM . . .

TESTING for QUALITY CONTROL AFTER PRODUCT DEVELOPMENT

Room 101

Co-Moderators—R. F. Thomson, General Motors Corp.; T. E. Piper, Convair Div., General Dynamics Corp.

Quality Control on Semifinished Product.
Wrought Materials.
Cast Materials.

Quality Control on Component Manufacture.
Automotive.
Aircraft.

Monday, Nov. 4—9 a.m.

CONFERENCE ON PLUTONIUM

Session at Palmer House

General Chairman—Arthur S. Coffinberry, Los Alamos National Laboratory.

Plutonium—Historical Review; Present Activities, Prospects.

Co-Chairmen—Glenn T. Seaborg, Radiation Laboratory, Berkeley, Calif. and Cyril S. Smith, University of Chicago.

Monday, Nov. 4—2 p.m.

Role of Plutonium in Nuclear Power

Co-Chairmen—Walter H. Zinn, consultant, former head of Argonne National Laboratory; H. M. Finniston, U. K. Atomic Energy Authority, Harwell, England.

Tuesday, Nov. 5—9 a.m.

Physical Properties of Plutonium

Co-Chairmen—E. R. Jette, Union Carbide Corp.; Dr. John Chipman, Massachusetts Institute of Technology.

Tuesday, Nov. 5—2 p.m.

Plutonium Alloys and Fuel Elements

Co-Chairmen—A. S. Coffinberry, and O. J. C. Runnallis, Atomic Energy of Canada Ltd., Chalk River, Ont.

Wednesday, Nov. 6—9 a.m.

Welding of Stabilized 18-8 Stainless Steels

Wednesday, Nov. 6—2 p.m.

Welding in Nuclear Power Generators

Thursday, Nov. 7—9 a.m.

Advanced Metallographic Techniques

Thursday, Nov. 7—2 p.m.

Metallography of Nuclear Materials

1957 EDUCATIONAL LECTURE SERIES

Sessions in Room 14, Palmer House

Monday, Nov. 4—9:30 a.m.

Introductory, Summary Lectures—Precipitation From Solution—Dr. R. F. Mehl, Carnegie Institute of Technology.

10 a.m. — **Theory and Mechanism** — Dr. J. B. Newkirk, General Electric Co.

11:15 a.m.—**Precipitation in Copper Alloys**—Dr. William D. Robertson, Yale University, and Robert Bray.

2 p.m.—**Precipitation Reactions in Irons and Low Alloy Steels**—H. W. Paxton, Carnegie Institute of Technology.

3 p.m.—**Precipitation in Iron Base Alloys**—Dr. Adolph J. Lena, Allegheny Ludlum Steel Corp.

Tuesday, Nov. 5—9:30 a.m.

Precipitation Hardening Aluminum Base Alloys—Dr. W. A. Anderson, Aluminum Co. of America.

10:30 a.m.—**Precipitation Reactions in Magnesium Alloys**—Dr. R. S. Busk, Dow Chemical Co.

2 p.m.—**Some Age-Hardening Characteristics of Nickel-Rich, Nickel-Chromium and Nickel-Chromium-Iron Alloys Containing Titanium and Aluminum**—Dr. R. J. Raudebaugh and Clarence Bieber, International Nickel Co.

3 p.m.—**Precipitation in Cobalt Base Alloys**—Glenn A. Fritzlen, Haynes Stellite Co.

Special Libraries Association Metals Division

Knickerbocker Hotel

Wednesday, Nov. 6—9:30 a.m.

PROGRESS IN NONFERROUS METALLURGY

Armour Research Foundation (Limited to Metals Division Members), Commons Lounge, 3200 S. Wabash.

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Recent Development in Nonferrous Metallurgy—Dr. D. W. Levinson, Metals Research Dept.

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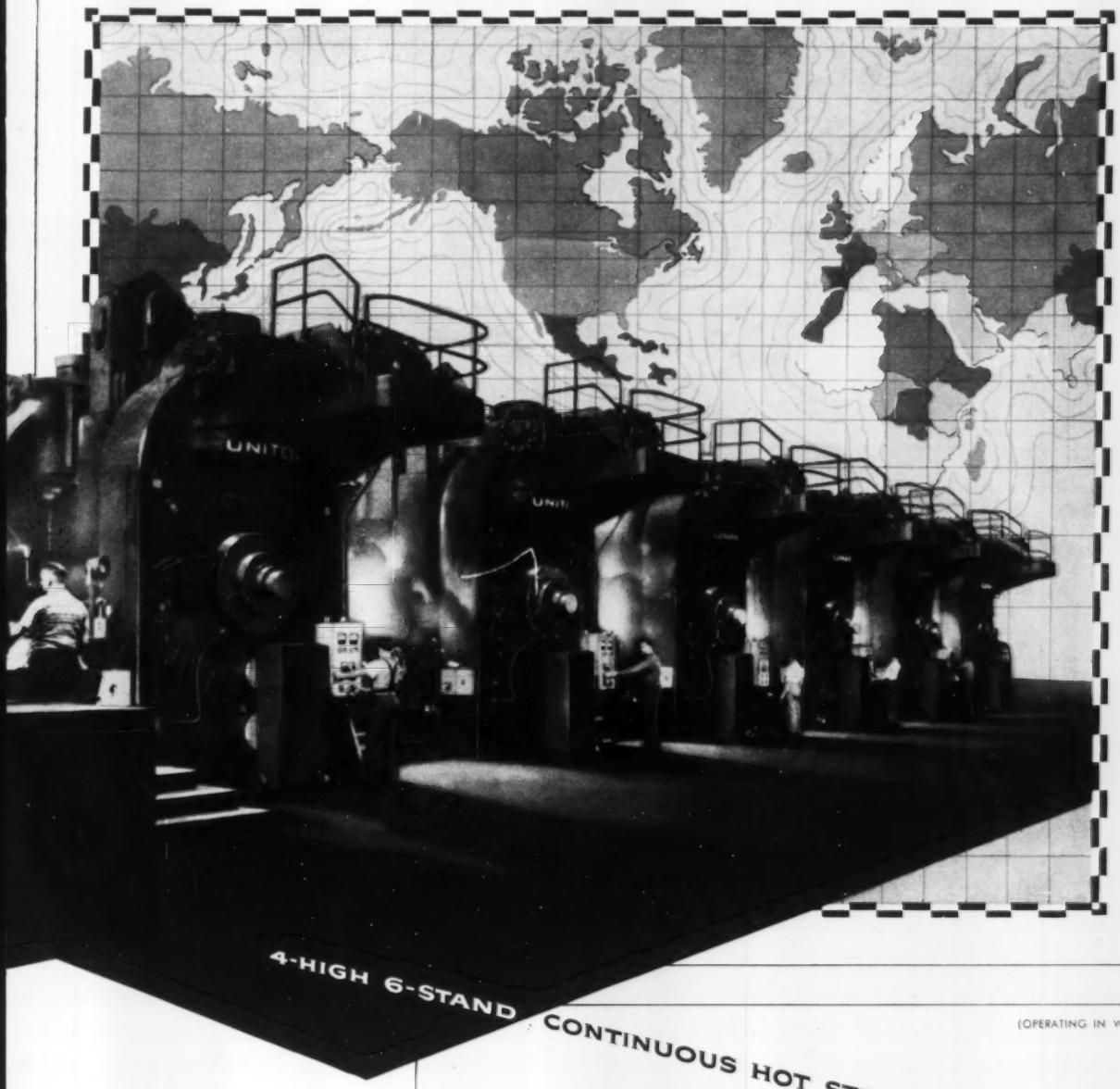

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ASM PROGRAM . . .

The Report and Document Library at Armour Research Foundation — Mary Patricia Murray, Report and Document Librarian.

Design of a Punch Card System as an Example of Literature Research at Armour Research Foundation—Ann P. Wennerberg, Literature Research Section.

Thursday, Nov. 7—9:30 a.m.

PROGRESS IN FERROUS METALLURGY

International Harvester Co., Central School, 190 E. Delaware Place.

Presiding—J. J. Beinlich, U. S. Steel Corp.

Recent Advances in Ferrous Research —Dr. R. H. Aborn, U. S. Steel Corp.

Metallurgy and Physics—Dr. D. S. Lieberman, University of Illinois.

Developments in High Temperature Alloys—M. C. Metzger, Universal Cyclops Steel Corp.

Friday, Nov. 8—9:30 a.m.

INTERNATIONAL ASPECTS OF LITERATURE RESEARCH

International Harvester Co., Central School, 190 E. Delaware Place.

Presiding—Marjorie R. Hyslop, Managing Editor, *Metal Progress*.

The Technical Library and Information Services for the British Metallurgical Industries—Anthony Post, The Iron and Steel Institute, London, England.

Activities and Functions of the Centre de Documentation Siderurique — Dr. Marc Allard, Institute de Recherches de la Siderurgie and Max Dupont, Centre de Documentation, Siderurique, St. Germain-en-Laye, France.

Bibliographic Services Within Aluminum-Industrie—Dr. Ernst A. Bloch, Aluminium-Industrie AG, Neuhausen am Rheinfall, Switzerland.

Importance of Documentation—Frank T. Sisco, Engineering Foundation, New York.

H. Luling, chief metallurgist of Georg Fischer Aktiengesellschaft, Schaffhausen, Switzerland, will describe the scope and function of the new library recently established by this European iron foundry.

AIME

Institute of Metals Division AIME

John C. Kinnear Jr., President

Monday, Nov. 4—9 a.m.

SEMINAR ON STRUCTURE OF SOLID SOLUTIONS

Constitution Room, Morrison Hotel

Elastic Constants of Solid Solutions —Charles S. Smith, Case Institute of Technology.

Resistance Anomalies in Dilute Alloys —R. W. Schmitt, General Electric Co.

Nuclear Magnetic Resonance in Metals and Alloys—T. J. Rowland, Electro Metallurgical Co.

DEFORMATION

Cotillion Room, Morrison Hotel

Effect of Deformation and Low Temperatures on the Structures of AgCd and AuZn—D. B. Masson and C. S. Barrett, University of Chicago.

Role of Rate-History in the Calculation of Creep Behavior—J. D. Lubahn, General Electric Co.

Temperature Dependence of the Yield Stress for Copper and Aluminum—W. D. Sylwestrowicz, Bell Telephone Laboratories.

Grain Boundary Deformation in Fine-Grained Electrolytic Magnesium—S. L. Couling, Dow Chemical Co.; C. S. Roberts, Shockley Semiconductors Laboratory.

Activation Energies for Creep of Single Aluminum Crystals Favorably Oriented for (111) (101) Slip —J. Lytton, L. Shepard, and J. E. Dorn, University of California.

Size Effects in the Deformation of Aluminum: Part I—Bicrystals: Part II—Single Crystals—R. L. Fleischer and Bruce Chalmers, Harvard University.

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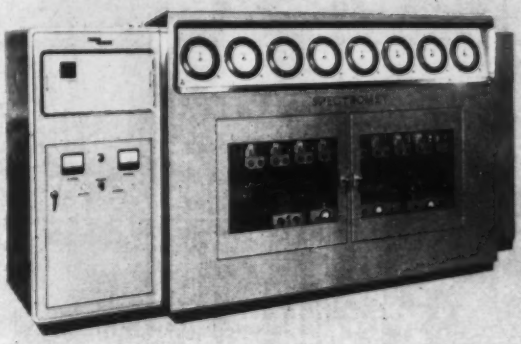

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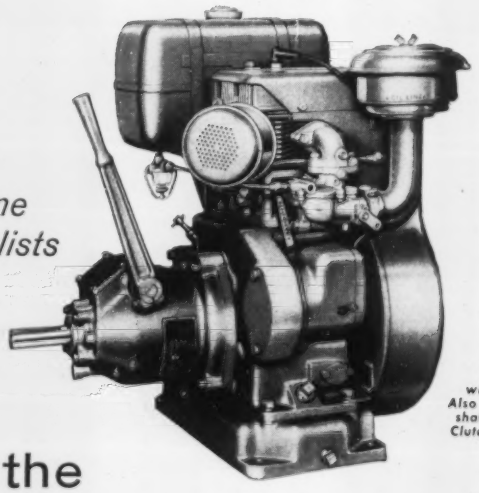

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AIME PROGRAM . . .

tered-Cubic Metals—E. T. Wessel, Westinghouse Electric Corp.

Effect of Strain and Temper Embrittlement on the Impact Transition Temperature of an AISI E-6150 Steel—E. F. Steeb, North American Aviation; P. C. Rosenthal, University of Wisconsin.

STRUCTURES AND PROPERTIES OF METALS AND ALLOYS

Embassy Room, Morrison Hotel

Preferred Orientations in Castings—Derek Walton, Harvard University.

Reorientation Textures Developed by Isothermally Annealing Cold-Rolled Iodide Titanium—C. J. Sparks Jr., Wright Air Development Center; J. P. Hammond, Oak Ridge National Laboratory.

Ductility in Beryllium Related to Grain Orientation and Grain Size—J. Greenspan, Nuclear Metals Inc.

Effects of Various Preferred Orientations on the Dimensional Stability of Uranium—W. V. Cummings, General Electric Co.

Dimensional Stability of U-Cr Alloys—M. C. Fraser, G. A. Last, and S. H. Bush, General Electric Co.

Study of the Effect of Reactor Irradiation on the Microstructure of Uranium—T. K. Bierlein and B. Mastel, General Electric Co.

Irradiation Effects on the Tensile Properties of Zircaloy-2—R. S. Kemper Jr. and D. L. Zimmerman, General Electric Co.

Brittleness and the Thermal Expansion Behavior of Titanium Carbide Base Cermets—H. W. Newkirk Jr., General Electric Co.; H. H. Sisler, Ohio State University.

Estimation of Coefficients for the Reactive Diffusion of Carbon in Zirconium Carbide—E. Hirakis and M. A. Steinberg, Horizons Inc.

Surface Tensions of Ag-Au and Cu-Au Solid Solutions—S. S. White, C. M. Adams Jr., and J. Wulff, Massachusetts Institute of Technology.

Autoradiographic and Metallographic Evidence for a Metallic Second Phase in High-Purity Zinc—I. S. Servi, M. Stern, and W. W. Webb, Electro Metallurgical Co.

Monday, Nov. 4—2 p.m.

TITANIUM METALLURGY

Cotillion Room, Morrison Hotel

Phase Transformation in Hypoeutectoid Ti-Cr Alloys—H. I. Aaronson, W. B. Triplett, and G. M. Andes, Carnegie Institute of Technology.

Notch Tensile Properties of Selected Titanium Alloys—E. P. Klier, Syracuse University; N. J. Feola, Curtiss-Wright Corp.

Effect of Hydrogen on the Fatigue Properties of Titanium and Ti-Mn Alloys—L. W. Berger, W. S. Hyler, and R. I. Jaffee, Battelle Memorial Institute.

Hydrogen Distribution in Heat Treated Titanium Alloys as Established by Autoradiography—O. J. Huber, J. E. Gates, A. P. Young, M. Poberskin, and P. D. Frost, Battelle Memorial Institute.

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AIME PROGRAM . . .

Titanium and Titanium Alloys—W. M. Albrecht and M. W. Mallett, Battelle Memorial Institute.

Effect of Crystallographic Orientation and Oxygen Content on Knoop Hardness Values of Iodide Titanium—C. Feng and C. Elbaum, University of Toronto.

Effect of Hydrogen on Some Mechanical Properties of a Titanium Alloy Heat Treated to High Strength—H. A. Robinson, P. D. Frost, and W. M. Parris, Battelle Memorial Institute.

SYMPOSIUM ON THE RELATION OF STRUCTURE AND HIGH-TEMPERATURE PROPERTIES

Grand Ballroom, Morrison Hotel

Influence of Carbon and Nitrogen on Creep and Creep-Rupture Properties and Structure of 18 Cr-8 Ni and 18 Cr-8 Ni-Mo Steels—G. V. Smith, Cornell University; F. Garofalo and L. Zwell, U. S. Steel Corp.

Effect of Interstitial Elements on the Properties of Cr-Mn-N-C Steels—Chi-Mei Hsiao and E. J. Dulis, Crucible Steel Co. of America.

Microstructural Changes in a 42% Ni-30% Cr-25% Fe Alloy During Creep Rupture Testing—E. P. Sadowski and R. J. Raudebaugh, International Nickel Co.

Nickel-Chromium Base Alloys Hardened With Refractory Oxide Additions—A. W. Cochandt, Westinghouse Electric Corp.

Contribution of Spherical and Plate-like Precipitate Particles to Creep and Tensile Strength—E. E. Underwood, Battelle Memorial Institute.

Creep and Structural Studies of Two-Phase Al-Au Alloys—R. Pelloux, A. R. Chaudhuri, and N. J. Grant, Massachusetts Institute of Technology.

RESEARCH SUMMARIES ON STRUCTURE OF SOLID SOLUTIONS

Constitution Room, Morrison Hotel

Solubility of Hydrogen in Thorium Metal—D. T. Peterson and D. G. Westlake, Iowa State College.

Free Energy Changes Attending the Martensitic Transformation in the Fe-Cr and Fe-Cr-Ni Systems—Larry Kaufman, Massachusetts Institute of Technology.

Calculation of Entropies of Solute Atoms from Solid Solubilities—J. F. Freedman, Yale University; A. S. Nowick, Columbia University.

Elastic Interaction of Interstitial Atoms in Body-Centered Cubic Crystals—J. C. Fisher, General Electric Co.

Misfit Strain Energy in the Au-Cu System—Ralph Hultgren, University of California.

An Acoustical Study of Low-Temperature Aging in Al-4.2 Cu—M. E. Fine and C. Chiou, Northwestern University.

Alloying Behavior of Ni_3Al (γ' Phase)—R. W. Guard and J. H. Westbrook, General Electric Co.

DEFORMATION AND OXIDATION

Embassy Room, Morrison Hotel

Hydrogen, Crack Initiation and Delayed Failure in Steel—H. H. Johnson, J. G. Morlet, and A. R. Troiano, Case Institute of Technology.

Fracture of Zinc Monocrystals and Bicrystals—J. J. Gilman, General Electric Co.

Temperature Dependence of Flow and Fracture in Coated Zinc Single Crystals—L. C. Weiner, Columbia University.

Pyramidal Slip in Magnesium—R. E. Reed-Hill and W. D. Robertson, Yale University.

Grain Boundary Shear in Aluminum—F. Weinberg, Department of Mines and Technical Surveys, Ottawa, Ont.

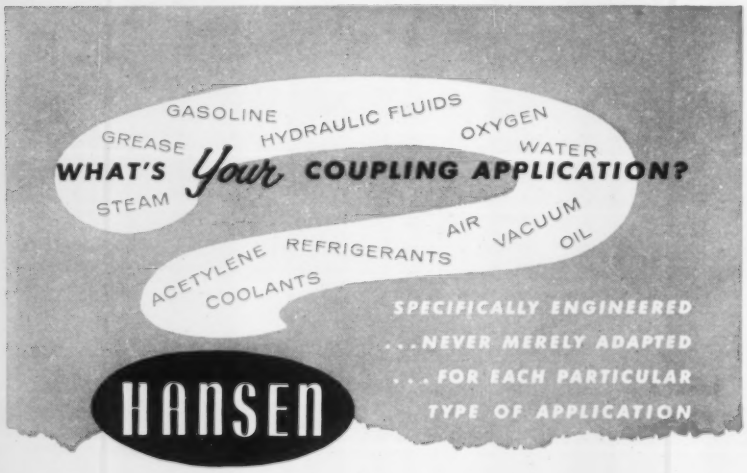
Delay Time in Face-Centered Cubic Metals—I. R. Kramer and H. R. Peiffer, Rias Inc.

Work Hardening on the Latent Slip Directions of Alpha-Brass During Easy Glide — W. L. Phillips and W. D. Robertson, Yale University.

Impurity Substructures in Zinc Single Crystals—H. G. F. Wilsdorf, Franklin Institute.

Oxidation of Zircaloy-2 and 3A at 300 to 850° C—E. A. Gulbransen and K. F. Andrew, Westinghouse Electric Corp.

Structural Aspects of the Corrosion of Stainless Steel at 500 to 700° C in Gaseous Atmospheres—E. A. Gulbransen, T. Copan, and D. van Rooyen, Westinghouse Electric Corp.



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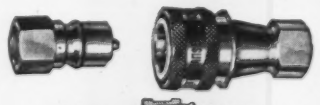

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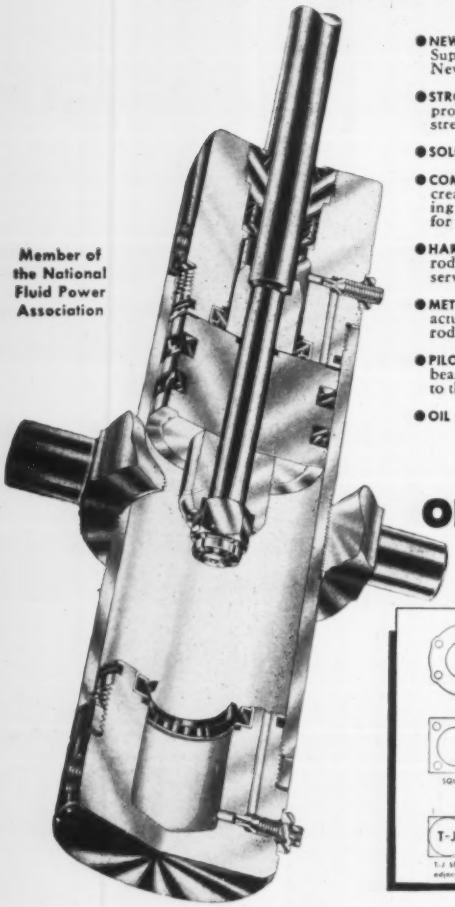

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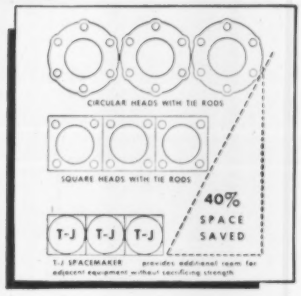

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AIME PROGRAM . . .

Fabrication of Uranium Dioxide Fuel Element Shapes by Hydrostatic Pressing—H. W. Newkirk Jr. and R. J. Anicetti, General Electric Co.

Tuesday, Nov. 5—9 a.m.

SYMPOSIUM ON TITANIUM

Grand Ballroom, Morrison Hotel

Introductory Remarks—L. S. Busch, Mallory-Sharon Titanium Corp.

United States Progress in Titanium—1956-1957—W. J. Harris Jr., Battelle Memorial Institute.

(Question and Answer Period)

European Progress in Titanium

(Question and Answer Period)

SEMINAR ON SCIENCE OF METAL HARDENING

Cotillion Room, Morrison Hotel

Effect of Alloying on the High-Temperature Creep Properties of Metals—J. Weertman, U. S. Naval Research Laboratory.

Magnetic Study of Precipitation Hardening—J. D. Livingston, General Electric Co.

Strength of Age-Hardened Alloys—A. Kelly, Northwestern University.

Inhomogeneous Deformation in the Austenite - Martensite Transformation—D. S. Lieberman, University of Illinois.

NONFERROUS AND HIGH TEMPERATURE ALLOYS

Embassy Room, Morrison Hotel

Sand Cast Magnesium-Rare Earth Metal-Zirconium Alloys — T. E. Leontis, Dow Chemical Co.; D. H. Feisel, Carnegie Institute of Technology.

Blister Formation in Rolled Aluminum—J. H. O'Dette, Aluminum Laboratories Ltd., Canada.

On the Release of Hydrogen from Molten Aluminum—Asutosh Pal, Aunapurna Metal Works, India; H. M. Davis, Pennsylvania State University.

Elastic Properties of Yttrium and the Rare Earth Elements—J. F. Smith, C. E. Carlson, and F. H. Spedding, Iowa State College.

Gas Desorption of Copper Powders—J. C. Tobin, General Electric Co.; M. J. Sinnott, University of Michigan.

Copper-Silica and Copper-Alumina Alloys of High-Temperature Interest—K. M. Zwilsky and N. J. Grant, Massachusetts Institute of Technology.

Metallurgical Observations of Nitrides in Chromium—I. S. Servi and W. D. Forgeng, Electro Metallurgical Co.

Determination of Orientation in Magnesium by Polarized Light—C. W. Pearsall and S. J. Couling, Dow Chemical Co.

RECENT DEVELOPMENTS IN STEELMAKING PRACTICES

Session I

Exhibit Hall

Nitrogen Control and Nitrogen Content of Steels — K. G. Speith and H. vom Ende, Mannesmann-Huettenwerke A.G., Germany.

Observations Regarding Properties and Performance of Continuously Cast Low-Carbon Steel Products—R. N. Edmonson, L. Mair, and M. Tenenbaum, Inland Steel Co.

Vacuum Arc Melting—E. W. Johnson, Westinghouse Electric Corp.

AIME PROGRAM . . .

Observations of the Russian Steel Industry—N. J. Grant, Massachusetts Institute of Technology.

Tuesday, Nov. 5—2 p.m.

SYMPOSIUM ON TITANIUM

Grand Ballroom, Morrison Hotel

Introductory Remarks—L. S. Busch, Mallory-Sharon Titanium Corp.

Opinions and Ideas on the Manufacture and Use of Titanium—N. E. Promisel, Bureau of Aeronautics, U. S. Navy, panel and discussion moderator.

Tuesday, Nov. 5—2 p.m.

RESEARCH SUMMARIES ON SCIENCE OF METAL HARDENING

Cotillion Room, Morrison Hotel

Solute Strengthening in 80% Ni-20% Cr Alloys—R. W. Guard, General Electric Co.

Substitutional Solution Hardening in Copper Alloys — Carl Wiseman, University of California.

Quench Hardening in Pure Gold—J. W. Kauffman and M. Meshii, Northwestern University.

Grain Boundary Sliding in Copper Bi-Crystals — J. Intrater and E. S. Machlin, Columbia University.

Effect of Carbide Dispersion on the Strength of Tempered Martensite—A. M. Turkalo and J. R. Low Jr., General Electric Co.

Dispersion Hardening by Spherical Particles — H. R. Peiffer, R. H. Read, and A. J. Shaler, Pennsylvania State University.

Detection of Dislocation Tilts and Strains by X-Rays—Larry Kaufman and S. A. Kulin, Massachusetts Institute of Technology.

NUCLEAR METALS

Embassy Room, Morrison Hotel

Effect of Heat Treatment on Hardness and Microstructure of U-Ti Alloys—D. L. Douglass and L. L. Marsh Jr., Battelle Memorial Institute.

Preferred Orientation in Rolled Uranium Rods — M. H. Mueller and H. W. Knott, Argonne National Laboratory; W. P. Chernock, Combustion Engineering Inc.; and P. A. Beck, University of Illinois.

Transformation Kinetics of U-Zr Alloys Containing 50 and 60% Uranium—J. J. Kearns, Westinghouse Electric Corp.

Uranium-Silicon Epsilon Phase—S. Isserow, Nuclear Metals Inc.

Irradiation Stability of Low-Weight Per Cent U-Zr Alloys—A. W. Willis, General Electric Co.

Metallography of Irradiated Uranium—Preparation; Cathodic Vacuum Etching; Replication — T. K. Bierlein, J. R. Morgan, and G. R. Mallett, General Electric Co.

Corrosion Mechanism of Uranium-Base Alloys in High-Temperature Water—M. W. Burkart and B. Lustman, Westinghouse Electric Corp.

A Mechanism by Which Zirconium and Titanium Inhibit Corrosion and Mass Transfer of Steels by Liquid Heavy Metals—O. F. Kammerer, J. R. Weeks, J. Sadofsky, W. E. Miller, and D. H. Gurinsky, Brookhaven National Laboratory.

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AIME PROGRAM . . .

(Session II)
IRON AND STEEL DIVISION
CONTINUOUS STEELMAKING
Exhibit Hall

Some Thoughts on Continuous Steelmaking and Its Development—J. F. Elliott, Massachusetts Institute of Technology.

Discussion, panel of well-known metallurgists.

Tuesday, Nov. 5—6:30 p.m.
INSTITUTE OF METALS DIVISION
(Annual Fall Dinner)
Cotillion Room, Morrison Hotel

Toastmaster: W. R. Hibbard Jr., Chairman, Institute of Metals Division.

Welcome: Michael Tenenbaum, Chairman, Chicago Section AIME.

Speaker: John A. Wilson, Oriental Institute, University of Chicago.

Wednesday, Nov. 6—9 a.m.
SYMPOSIUM ON URANIUM AND URANIUM DIOXIDE
Grand Ballroom, Morrison Hotel

Development of Casting Techniques for Uranium and Uranium Alloys—G. E. Jaynes, D. T. Doll, and J. M. Taub, Los Alamos Scientific Laboratory.

Uranium Ingot Production at AEC Feed Materials Production Centers—B. J. Buntz, Mallinckrodt Chemical Works.

Induction Melting of Uranium-Base Alloys—N. J. Carson, Argonne National Laboratory.

Melting and Casting of U-Zr-Cb Alloys—N. J. Carson and J. E. Baird, Argonne National Laboratory.

Centrifugal Casting of U-Zr Alloy Rods—A. B. Shuck, Argonne National Laboratory.

Injection Casting of Uranium Fission Alloy Pins — F. L. Yaggee, J. E. Ayer, and H. F. Jelinek, Argonne National Laboratory.

Arc Melting of Uranium-Rich Alloys—W. H. Britton and W. V. Haynes, Westinghouse Electric Corp.

Press Forging of Ingot Uranium—J. A. Fellows and H. J. Schaffer, Mallinckrodt Chemical Works.

Rolling of Uranium — G. S. Hanks, J. M. Taub, and D. T. Doll, Los Alamos Scientific Laboratory.

FERROUS METALLURGY
Constitution Room, Morrison Hotel

Distribution of Boron in Gamma Iron Grains — R. M. Goldhoff, General Electric Co.; J. W. Spretnak, Ohio State University.

Some Observations on 885° F Embrittlement—G. F. Tisinai and C. H. Samans, Standard Oil Co. (Ind.)

Studies on the Behavior of Oxygen in Cast Iron — Gustaf Ostberg, Falu Kopparverk, Sweden.

Hot-Pressure Bonding of Iron to Aluminum—A. Bartoszak, J. Bedell, and S. Storchheim, Martin Co.

DIFFUSION
Cotillion Room, Morrison Hotel

Diffusion of the Elements of the I-B and II-B Sub-Groups in Silver—A. Sawatzky, Franklin Institute; F. E. Jaumot Jr., General Motors Corp.

Diffusion of Mg, Si, and Mo in Nickel—R. A. Swalin and R. Olsen, University of Minnesota; Alan Martin, Vanadium Corp. of America.

Molecular Diffusion and Interphase Transfer in the Solid-Copper-Molten Lead System — J. W. Gorman, Standard Oil Co. (Ind.); G. W. Preckshot, University of Minnesota.

Approximate Method for Calculations Using Concentration - Dependent Diffusion Coefficients—A. G. Guy, M. Golomb, and A. S. Yue, Purdue University.

TITANIUM
Embassy Room, Morrison Hotel

Analysis of Titanium Alloys by the Vacuum Fusion Method—H. Littmen, R. P. Barber, and H. P. Munger, Syracuse University.

Electrical Resistivity Anomalies in Titanium-Oxygen Alloys — R. J. Wasilewski, E. I. du Pont de Nemours & Co.

Interaction of Oxygen with Dislocations in Alpha Titanium and Its Effect on the Ductile-to-Brittle Transition—Devendra Gupta, New York University; Sheldon Weinig, Materials Research Corp.

Effect of Alpha-Beta Ratio on the Heat Treated Properties of Titanium Alloys—R. J. Quigg, E. L. Harmon Jr., and A. R. Troiano, Case Institute of Technology.

Grain Boundary Adsorption of Solutes and Its Effect on the Creep Properties of Alpha Titanium—J. Winter, New York University; Sheldon Weinig, Materials Research Corp.

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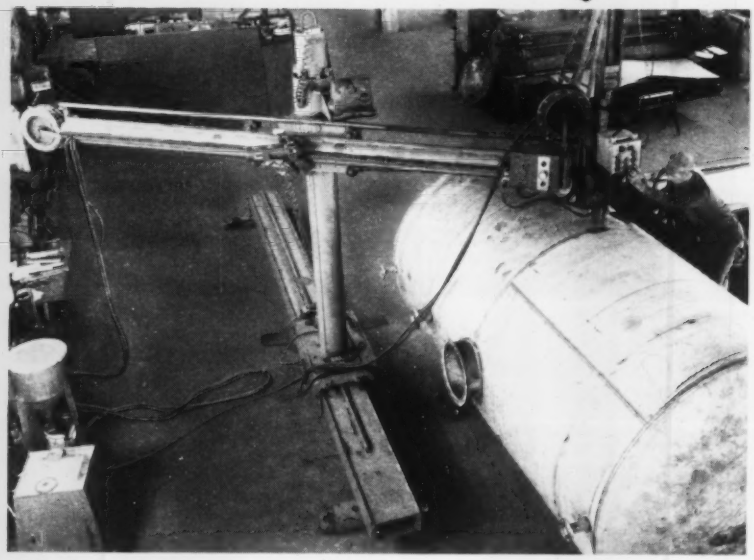

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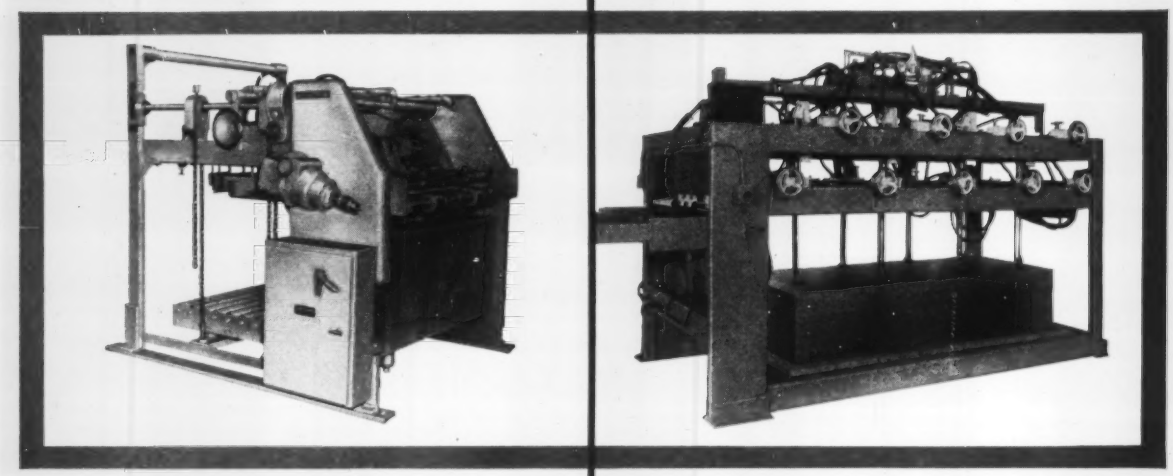

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Dexter Plate Feeder handles metal plates up to 3/16" thick and a maximum size of 4-by-12 feet. Used in many plants for feeding descaling equipment.

CHECK WITH DEXTER

Dexter's been designing and building sheet handling equipment for over 75 years...*sheet feeders* for metal decorating presses, scroll shears, punch presses, coaters, slitters...*pack turnovers* for speeding up two operation processes...*oven strippers* and *pilers*...*cardboard* and *corrugated board feeders* for presses and packaging lines ...*paper feeders* for printing presses, varnishers and folding machines. For almost any sheet feeding problem Dexter has the answer...with its wide range of equipment.

Dexter Feeders are available in over a hundred sizes, speeds and load capacities to suit individual machine or process requirements. Sheet sizes range from 14 x 14" to four by twelve feet...sheet thickness from .006" to 3/16" or more...load capacities from 6,000 to 30,000 pounds ...and speeds from 600 to 9000 per hour!

Thousands of Dexter sheet handling machines are in use today in container plants, electrical equipment factories, appliance manufacturing plants, in tin plating lines, printing and binding companies, and in a wide variety of other industries...speeding up production efficiently and economically.

If you need help with your sheet feeding problems—check with Dexter. Their combination of engineering experience and equipment flexibility may be the solution for increasing your productivity.

Write or call for complete details.

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DIVISION OF MIEHLE-GOSS-DEXTER, INC.

General Offices: 219 East 44th Street, New York 17, New York

AIME PROGRAM . . .

Elevated Temperature Characteristics of Internally Oxidized Titanium-Cerium Alloys—R. H. Hiltz Jr., and N. J. Grant, Massachusetts Institute of Technology.

Wednesday, Nov. 6—2 p.m.

SYMPOSIUM ON URANIUM AND URANIUM DIOXIDE
Grand Ballroom, Morrison Hotel

Extrusion of Uranium — P. Loewenstein, Nuclear Metals Inc.

Cold Working of Uranium — J. M. Taub, D. T. Doll, and G. S. Hanks, Los Alamos Scientific Laboratory.

Fusion Welding of Uranium—E. L. Brundige, D. T. Doll, G. S. Hanks, and J. M. Taub, Los Alamos Scienific Laboratory.

Powder Metallurgy of Uranium and Uranium Alloys — J. L. Zambrow, Sylvania-Corning Nuclear Corp.

Various Methods of Preparing Uranium Dioxide for Fuel Element Use —G. W. Thompkin, D. E. Rhodes, and C. M. Henderson, Mallinckrodt Chemical Works.

Fabrication of Bulk Form Uranium Dioxide for Use as Nuclear Reactor Fuel—J. Glatter, Westinghouse Electric Corp.

Fabrication of High-Density Uranium Dioxide Fuel Components for the First Pressurized Water Reactor Core—T. J. Burke, J. Glatter, H. R. Hoge, and B. E. Schaner, Westinghouse Electric Corp.

TRANSFORMATIONS
Constitution Room, Morrison Hotel

Micrographic Investigation of Precipitation in Pb-Sn Alloys—D. Turnbull and H. N. Treaftis, General Electric Co.

Mechanism of Precipitation in an Alloy of Copper with 2.5% Iron—J. B. Newkirk, General Electric Co.

Effect of High-Temperature Aging on the Development of Minor Phases in an Age-Hardening Nickel-Base Alloy—W. C. Bigelow, J. A. Amy, and L. O. Brockway, University of Michigan.

X-Ray Investigation of Recrystallized Aluminum—S. Weissman, Rutgers University.

Transformation Kinetics and Mechanical Properties of Zr-Mo Alloys—R. F. Domagala, D. W. Levinson, and D. J. McPherson, Armour Research Foundation.

Textures of Cold Rolled and Recrystallized Crystals of Si-Fe—J. L. Walter and W. R. Hibbard Jr., General Electric Co.

Information on "Nuclei" for Secondary Recrystallization in Si-Fe—C. G. Dunn, General Electric Co.; P. K. Koh, Allegheny Ludlum Steel Corp.

Intermetallic Compounds in Titanium Hardened Alloys—H. J. Beattie Jr., and W. C. Hagel, General Electric Co.

GENERAL METALLURGY
Cotillion Room, Morrison Hotel

Precipitation and Magnetic Annealing in a Cu-Co Alloy—J. J. Becker, General Electric Co.

Processing and Properties of Co-P+ Permanent Magnet Alloys—D. L. Martin, General Electric Co.

Elimination of Magnetic Effects in Be-Cu — Harold Bernstein, U. S. Naval Gun Factory.

Nitrides of Silicon—W. D. Forgeng, Electro Metallurgical Co.; B. F. Decker, General Electric Co.

CaCl-Type Ordered Structures in Binary Alloys of Transition Elements —T. V. Philip, Crucible Steel Co. of America; P. A. Beck, University of Illinois.

Atomic Size Effects in Cr3O-Type Structures—M. V. Nevitt, Argonne National Laboratory.

Some Internal Friction Studies in Columbium — R. W. Powers and Margaret V. Doyle, General Electric Co.

Effect of Crystal Orientation, Temperature, and Molten Zone Thickness in Temperature — Gradient Zone Melting—J. H. Wernick, Bell Telephone Laboratories.

RELATION OF STRUCTURE AND HIGH-TEMPERATURE PROPERTIES
Embassy Room, Morrison Hotel

Young's Modulus of Magnesium Alloys at Elevated Temperatures as a Function of Metallurgical Variables and Microstructure—R. W. Fenn Jr., Dow Chemical Co.

Structure and Creep Resistance of Magnesium Alloys — E. F. Emley, Magnesium Elektron Ltd., Swinton, Manchester, England.

Role of Recovery and Recrystallization on the Creep Rupture Behavior of 2S Aluminum—M. B. Happ and N. J. Grant, Massachusetts Institute of Technology.

Study of Structural Modifications of Steel During High-Temperature Deformation—C. Crussard and R. Tamhankar, Institute de Recherches de la Siderurgie, France.

Role of Subgrains in Creep—J. E. Dorn and L. Shephard, University of California.

Role of Grain Boundaries in Creep—E. R. Parker, University of California.

Thursday, Nov. 7, 9 a.m.

DEFORMATION AND RELATED PROBLEMS
Embassy Room, Morrison Hotel

Role of Polygonization in Creep — R. W. Guard, General Electric Co.

Comparison of the Creep-Rupture Properties of Nickel in Air and Vacuum—P. Shahinian and M. R. Achter, U. S. Naval Research Laboratory.

Deformation of Rhenium — A. T. Churchman, Associated Electrical Industries Ltd., England.

Internal Friction in Aluminum at Low Temperature — A. J. Filmer, G. J. Hutton, and T. S. Hutchison, Royal Military College of Canada.

Deformation of Aluminum Single Crystals at −77° C—A. Kelly and S. Sato, Northwestern University.

Resistivity Recovery in Cold Worked Aluminum—H. R. Peiffer and I. R. Kramer, Rias Inc.

Mechanical Behavior of Microcrystals —W. W. Webb and W. D. Forgeng, Electro Metallurgical Co.

Motion of Dislocations Opposed by a Frictional Force — H. R. Peiffer, Rias Inc.

Viscous Dislocation Motion in Li-F—J. J. Gilman and W. G. Johnston, General Electric Co.

Strength of Two-Phase Structures of Simple Geometry — H. R. Peiffer and R. H. Read, Rias Inc.; A. J. Shaler, Pennsylvania State University.

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SILLIMANITE 343 is a wet air-setting mixture. SILLIMANITE 340 is a dry heat-setting mixture. Consult your Grefco representative as to which of the several varieties best suits your needs.

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AIME PROGRAM . . .

POWDER METALLURGY

Madison Room, Morrison Hotel

Study of Sintering of Aluminum Oxides—George Kuczynski, University of Notre Dame.

Rate of Infiltration of Metals—K. A. Semlak and F. N. Rhines, Carnegie Institute of Technology.

An Investigation of the Effect of Specific Surface Area of Certain Iron Powders on the Properties of Specimens Hot Coined Therefrom—D. P. Ferriss and J. G. Byrne, Stevens Institute of Technology.

Some High-Temperature Properties of Nickel and Cobalt Alloy Powder Extrusions Containing Nonmetallic Dispersions—C. G. Goetzel and Eric Gregory, Sintercast Corp. of America.

Development of Superior Cobalt-Base Alloys by Hot Coining Metal Powders with Minor Additives — D. P. Ferriss, Stevens Institute of Technology.

Thursday, Nov. 7—2 p.m.

EQUILIBRIUM STUDIES

Embassy Room, Morrison Hotel

Delta Phase Field of the U-Zr Equilibrium Diagram—J. F. Duffey and C. A. Bruch, General Electric Co.

Constitution of the Uranium-Rich U-Cb and U-Cb-Zr Systems—A. E. Dwight and M. H. Mueller, Argonne National Laboratory.

Nature of the Ni-Cr System—R. O. Williams, Cincinnati Milling Machine Co.

Activity Measurements in the System Iron-Chromium — C. L. McCabe, R. G. Hudson, and H. W. Paxton, Carnegie Institute of Technology.

Thermodynamic Study of Liquid Pb-Zn Solutions—F. D. Rosenthal and G. J. Mills, California Institute of Technology; F. J. Dunkerley, Rolle Manufacturing Co.

Solid Solubility of Uranium in Thorium and the Allotropic Transformation of U-Th Alloys—W. B. Wilson, A. E. Austin, and C. M. Schwartz, Battelle Memorial Institute.

Liquid Miscibility Gap in the Quaternary System Fe-Cu-S-C at 1450° C—D. L. Douglass, Ohio State University.

Uranium-Columbium Alloy Diagram—B. A. Rogers, D. F. Atkins, E. J. Manthos, and M. E. Kirkpatrick, Iowa State College.

TRANSFORMATIONS, ALLOYS

Madison Room, Morrison Hotel

Growth of Pearlite—L. S. Darken, R. M. Fisher, and J. M. Galligan, U. S. Steel Corp.

Effect of Applied Tensile Stress on Phase Transformations in Steel—L. F. Porter, and P. C. Rosenthal, Brookhaven National Laboratory.

Nature and Kinetics of Precipitation in a 16 Per Cent Vanadium, 2.5 Per Cent Aluminum-Titanium Alloy—E. L. Harmon, Electro Metallurgical Co.; A. R. Troiano, Case Institute of Technology.

Effect of Heat Treatment on the Coercive Force of Aluminum-Iron Alloys in the Ordering Region — K. Foster and D. Pavlovic, Westinghouse Electric Corp.

Diffusion of Heat and Mass in Growth of Precipitates from Supersaturated Solutions—C. M. Adams Jr., Massachusetts Institute of Technology.

Abnormal Grain Growth in High-Purity, Extruded Magnesium — F. D. Rosenthal and G. J. Mills, California Institute of Technology.

A Contribution to the Phase Diagram of Ag-Cu-Cd—K. M. Weigert, Curtiss-Wright Corp.

Heat Treatment, Transformation Reactions and Mechanical Properties of Some High-Strength Zirconium-Base Alloys—H. A. Robinson, J. F. Doig, M. W. Mote, and P. D. Frost, Battelle Memorial Institute.

Solid Solubility of Carbon in Copper-Nickel Alloys — M. E. Nicholson, University of Minnesota.

Solubility of Hydrogen in the 50% U-Zr Alloys — E. A. Gulbransen, K. F. Andrew, and R. J. Ruka, Westinghouse Electric Corp.

Thermal Fatigue of Ductile Materials —I. Effect of Test Conditions on the Thermal Fatigue Life of S-816 and Inconel 550 — F. J. Clauss, Lewis Flight Propulsion Laboratory; J. W. Freeman, University of Michigan.

Thermal Fatigue of Ductile Materials —II. Effect of Cyclic Thermal Stressing on the Stress-Rupture Life and Ductility of S-816 and Inconel 550 — F. J. Clauss, Lewis Flight Propulsion Laboratory; J. W. Freeman, University of Michigan.

LOOK...NO HANDS!

Society for Nondestructive Testing

R. F. Holste, President

All Sessions—Morrison Hotel

Sunday, Nov. 3—afternoon

Chairman—Dr. Gerold H. Tenney, Los Alamos Scientific Laboratory.

Organization for International Co-operation in the Field of Nondestructive Testing.

Monday, Nov. 4—9 a.m.

Chairman — Carlton H. Hastings, Avco Mfg. Corp.

The Basis for Optimum Test Methods Selection.

Keynote Speakers—

Dr. James Thewlis, Atomic Energy Research Establishment, Harwell, Didcot, Berks, England; Dr. Georges A. Homes, Professeur a la Faculte Polytechnique de Mons et a l'Universite Libre de Bruxelles, Bruxelles, Belgium; Don M. McCutcheon, Westinghouse Atomic Power Division.

Invited Discusser—S. A. Wenk, University of California.

Monday, Nov. 4—2 p.m.

Group Discussion

Director—Raymond A. Pulk, Detroit Arsenal.

Tuesday, Nov. 5—9 a.m.

TECHNICAL PAPERS

Chairman—Dr. Warren J. McGonnagle, Argonne National Laboratory.

Nondestructive Testing of Nuclear Power Reactor Components.

Nondestructive Testing of Fuel Elements for DIDO—Dr. James Thewlis, Atomic Research Establishment, Harwell, England.

The Fundamentals of Different Radiation Measurements—Richard A. Nickerson, Sandia Corp.

NRU—Some of Its Special Testing Problems—A. J. Mooradian, Atomic Energy of Canada Ltd., Chalk River, Ont.

Dimensional Measurements Using Nondestructive Testing Techniques—Bernard Cunningham, Westinghouse Electric Corp.

Tuesday, Nov. 5—1:30 p.m.

MEHL HONOR LECTURE

Mottling in Radiographs of Aluminum-Silicon-Copper Alloy Permanent Mold Castings—Dr. Kent R. VanHorn, Aluminum Co. of America.

Annual Meeting—Society of Nondestructive Testing (U. S. A.) and meeting of section delegates.

Tuesday, Nov. 5—7 p.m.

Social hour and 1957 annual banquet. Presentation of honor awards for technical achievement.

Wednesday, Nov. 6—a.m. and p.m.

Summary of Monday and Tuesday Discussion Director, Raymond A. Pulk, Detroit Arsenal.

Chairman — Carlton H. Hastings, Avco Mfg. Corp.

The Relative Advantages and Limitations of Nondestructive Test Methods.

Keynote Speakers—Dr. H. Krainer, Forschungszentrale, Gebr. Bohler & Co., Kapfenberg, Austria; Douglas W. Ballard, Sandia Corp.; L. Van-Ouwerkerk, Roentgen Technische Dienst, Rotterdam, Holland.

Invited Discussers—Prof. Hiroshi Kihara, Toyko University; Al Cota, A. O. Smith Corp.

Thursday, Nov. 7—9 a.m.

Educational Program on Nondestructive Testing Techniques.

Chairman—Don T. O'Connor, Machlett Laboratories.

Co-Chairman — Franklin S. Catlin, Magnaflux Corp.

Orientation—Don T. O'Connor, chairman, SNT Education Committee.

Magnetic Particle Inspection—W. E. Thomas, Magnaflux Corp.

Principles of Radiography—William D. Kiehle, Eastman Kodak Co.

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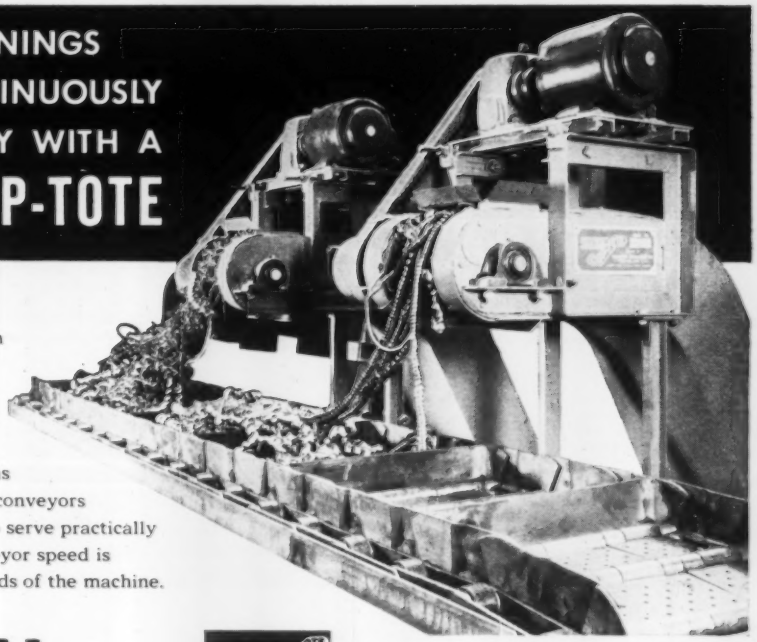

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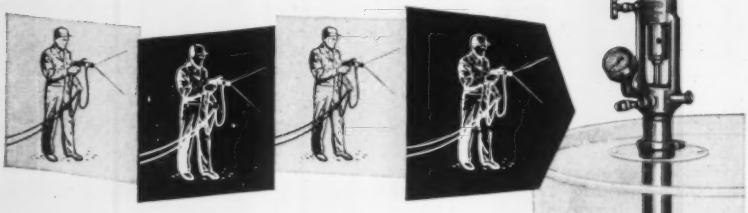
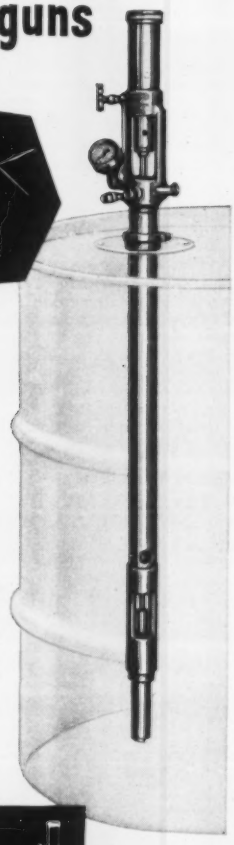
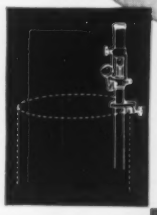




Binks new "Pogo" bung-type material handling pump cuts your finishing costs by letting you send paints and coatings direct from original shipping drum to your spray guns. The pump has plenty of power to supply up to four spray guns . . . either directly or through a paint circulating system.

Operates through 2" bung hole or from open drum. No longer need a 2" opening be a production bottle-neck. With an auxiliary clamp the pump may be operated from the rim of an open drum. A portable drum cover offers convenient, simultaneous operation of an agitator with the pump on an open top drum. A variety of pump and agitator mounting combinations is available.

Economical to operate — maintain. Double action pump strokes provide steady delivery up to one gallon per minute. . . Rugged construction insures perfect, long-life alignment of moving parts — reduces wear. The pump needs no lubrication. Spaced design separates motor from pump — positively prevents fluids from entering critical air motor parts.



Operates from open drum also. Can also be mounted with an agitator.

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SNT PROGRAM . . .

Industrial Fluoroscopy — Walter R. Hampe, Westinghouse Electric Corp.
Radiographic Film Interpretation—Artie L. Pace, General Electric Co.
Penetrant Testing—Taber DeForest, Magnaflux Corp.

Thursday, Nov. 7—1:30 p.m.

Educational Program (continued)
Eddy Current Testing in Theory—Dr. Glenn O. McClurg, Magnaflux Corp.
Eddy Current Testing in Practice—John W. Allen, Oak Ridge National Laboratory, Union Carbide Nuclear Co.
Ultrasonic Testing Pulse Method—John C. Smack, Curtiss-Wright Corp.
Ultrasonic Testing Resonant Method—Peter K. Bloch, Branson Instruments Inc.
Question period for entire panel of lecturers.

Friday, Nov. 8—a.m. and p.m.

Summary of Wednesday and Thursday
Discussion Director — Raymond A. Pulk, Detroit Arsenal.
Chairman—Carlton H. Hastings, Avco Mfg. Corp.
Recommendations for Technical Development and Standardization.
Keynote Speakers—Dr. Richard Seifert, R. Seifert & Co., Hamburg, Germany; Prof. Oscar Masi, Fiat-Div. Siderurgique, Turin, Italy; Robert B. Oliver, Oak Ridge National Laboratory.
Invited Discussers—Dr. Werner Felix, Sulzer Bros Ltd., Winterthur, Switzerland; Donald C. Erdman, Metrol Inc.

IHEA

Industrial Heating Equipment Association

Walter H. Holcroft
President

Tuesday, Nov. 5—9 a.m.

Palmer House

Modernization in Heating for Hot Forming—P. H. Morse, Magnethermic Corp.
The Metallurgy of Annealing in Fractional Minutes—R. K. Wuerfel, Westinghouse Electric Corp.
Techniques and Metallurgy of Induction Vacuum Melting — Walter Jones, General Electric Co.
Convection and Radiation in High Speed Heating—R. J. Reed, North American Mfg. Co.
Influence of High Speed Strip Annealing on Metallurgical Properties—Gilbert J. Langenderfer, Surface Combustion Corp.
Automation in Heating and Quenching—N. K. Koebel, Lindberg Engineering Co.

DoALL users say Band Sawing is the fastest, lowest cost CUT-OFF Method!

Typical blanks and parts cut-off with the DoALL Automatic Power Saw, showing unlimited range of this versatile band machine.

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". . . In the 19 months since we bought our DoALL Power Saw, we have used only 31 saw bands, which we feel is quite remarkable inasmuch as the machine has been used almost continuously—24 hours a day."—*Southwest Ornamental Iron Co., Kansas City, Mo.*

". . . we find we can hold our stock for finishing at a minimum as the saw cuts are accurate within a few thousandths."—*The Independent Machine Co., Cuyahoga Falls, Ohio*

"Since we have installed two new DoALL Power Cut-Off Saws equipped with Demon High-Speed Saw Blades, our production has increased from 200% to 300%."—*The Ridge Tool Co., Elyria, Ohio*

"Savings on material alone over the old method pays for the blades."—*Beaver Pipe Tools, Inc., Warren, Ohio*

"Blade life on alloy steels has averaged close to 5000 sq. in., and on HSS better than 6000 sq. in. Maintenance costs have been practically nil."—*Goddard & Goddard Co., Detroit, Mich.*

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1. **DoALL CUTTING SPEED**—up to 6 times faster than other band saws, and 2 to 3 times faster than power hacksaws!
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Model C-58 HIGH PRODUCTION

Power Saw, Automatic Stock feed indexing. (12" x 12" capacity.)

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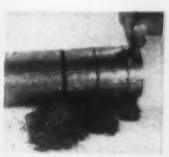

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Facts to consider when you're buying

Chromate Conversion Coatings

for Corrosion Protection, Paint Base, Decorative Finishing

WHAT IS IRIDITE®?

Briefly, Iridite is the tradename for a specialized line of chromate conversion finishes. They are generally applied by dip, some by brush or spray, at or near room temperature, with automatic equipment or manual finishing facilities. During application, a chemical reaction occurs that produces a thin (.00002" max.) gel-like, complex chromate film of a nonporous nature on the surface of the metal. This film is an integral part of the metal itself, thus cannot flake, chip or peel. No special equipment, exhaust systems or specially trained personnel are required.

If your company is manufacturing or buying parts or complete assemblies made from or plated with any of the more common non-ferrous metals—zinc, cadmium, aluminum, magnesium, silver, copper, brass or bronze—you've probably already run up against the question of finishing these surfaces with a chromate conversion coating. These coatings are used to protect against corrosion, or to provide a base for paint or to provide a decorative finish for sales appeal or shelf life. Since chromate conversion coatings represent a relatively new means of obtaining these finishes, this digest of facts to consider may be of value to you.

1. THE COATINGS THEMSELVES. There are many brands on the market. All are similar in many ways. Each, of course, offers its own specific advantages and these may relate to operating techniques, performance under actual use conditions, cost, availability, etc. Naturally, you'll want to choose a coating that is widely known and accepted under both military and civilian specifications.

2. THE COMPANY BEHIND THE PRODUCT. Is it a reliable, established organization? Does it offer experienced technical service, both from the field-engineering organization as well as the home office and laboratories? The man who sells and services your installation should be thoroughly familiar with not only chromate conversion coatings and their applications, but also with the characteristics and performance of related finishing operations such as precleaning, electroplating, painting, etc. This is most important since all steps of the finishing cycle must be functioning properly for the satisfactory performance of the ultimate finish produced.

3. AVAILABILITY OF THE PRODUCT. Ideally, of course, the material should be readily available to you from nearby warehouses to avoid time loss in long distance shipping and to provide emergency service, should the need arise.

4. COST. Naturally, the initial price of the material is important to you. However, just as you consider ultimate cost when you are buying mechanical equipment, ultimate cost must be considered for these finishing chemicals. So, it will pay you to investigate consumption costs, labor costs and the other factors which go into the determination of ultimate cost. Further, cost alone gives no indication of product performance, so careful attention must be given to the purpose the finish must serve and the value that finish will add to your product.

5. FACILITIES FOR RESEARCH AND DEVELOPMENT. Perhaps the existing types of chromate conversion coatings do not include a compound that will accomplish exactly what you wish. Then, it is important to deal with a supplier who has adequate research and development facilities available to work with you to produce a material to meet your needs. Naturally, such a project is seldom completed overnight. But, with complete cooperation and confidence from both you and your supplier, chances are a satisfactory program can be completed.

These are the concepts of sales and service on which we, Allied Research Products, Incorporated, have developed and marketed the line of Iridite chromate conversion coatings . . . superior product performance, complete sales and technical service, easy product availability, economical cost, extensive research and development facilities. No doubt you are familiar with our line and have seen this trademark—

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—in our advertising, technical literature or on shipping containers in your plant. Remember this trademark when you're buying or investigating chromate conversion coatings for your company. It's your assurance of quality, economical products from a reliable and established company, skilled sales and technical service from both our home office and a national network of representatives, immediate availability from warehouses in strategic industrial areas and our willingness to work with you to develop new finishes to meet your needs, should the present line fall short.

For complete information on Iridite chromate conversion coatings, write today for your free copy of our technical data file. Or, for immediate advice, call in your Allied Field Engineer. He's listed under "Plating Supplies" in your classified telephone book.

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Manufacturers of Iridite chromate conversion coatings for corrosion resistance, paint systems, final finishing of non-ferrous metals; ARP Plating Brightener & Chemicals. West Coast Licensee—L. H. Butcher Co.

39th NATIONAL METAL CONGRESS & EXPOSITION

EXHIBITORS

Chicago's International Amphitheatre will house all exhibits. The exposition opens at noon, closes at 10:30 p.m. Monday, Tuesday and Wednesday. Hours on Thursday and Friday are 10 a.m. to 6 p.m. Here are the exhibitors and the booths they will occupy.

A. I. T. Diamond Tool Co. Inc., Skokie, Ill. 1714
Aaron Machinery Co. Inc., New York .. 1505
Abrading Systems Co., Skokie, Ill. 1384
Acheson Colloids Co., Port Huron, Mich .. 112
Acme Steel Co., Chicago 441
Aircraft & Missiles Manufacturing, Philadelphia 456
Ajax Electric Co. Inc., Philadelphia 1406
Ajax Electrothermic Corp., Trenton, N. J. 1406
Ajax Engineering Corp., Trenton, N. J. .. 1406
Ajusto Equipment Co., Toledo, Ohio 1498
Mark Alan & Associates, Chicago 1388
Al-Fin Div., Fairchild Engine & Airplane Corp., Deer Park, N. Y. 915
Allegheny Ludlum Steel Corp., Pittsburgh 648
Allis-Chalmers Mfg. Co., Milwaukee 935
Allison-Campbell Div., American Chain & Cable Co. Inc., Bridgeport, Conn. 1849
Alloy Engineering & Casting Co., Champaign, Ill. 442
Aloris Tool Co. Inc., Clifton, N. J. 1589
American Brake Shoe Co., New York 336
American Cast Iron Pipe Co., Birmingham 1376
American Chemical Paint Co., Ambler, Pa. 201
American Cyanamid Co., Metal Chemicals Section, New York 1815
American Cystoscope Makers Inc., New York 1764
American Gas Assn., New York 718, 723, 726, 727, 734, 735, 738, 742, 754
American Gas Furnace Co., Elizabeth, N.J. 726
American Herforder Corp., Chicago 1667
American Machine & Metals Inc., East Moline, Ill. 820
American Machinist, New York 109
American Optical Co., Buffalo 1047
American Positive Grip Vise Corp., Williamsett, Mass. 1581
American Pullmax Co. Inc., Chicago 1065
American Silver Co., Flushing, N. Y. .. 815
American Society for Metals, Cleveland .. 553
Ampco Metal Inc., Milwaukee 1768
Amperex Electronic Corp., Hicksville, N. Y. 1630
Amplex Div., Chrysler Corp., Detroit .. 1663
Apparatus Sales Div., General Electric Co., Schenectady, N. Y. 1468
Arnold Research Laboratories, Glendale, Calif. 1239
Arcair Co., Lancaster, Ohio 1271
Arcweld Mfg. Co., Grove City, Pa. 1019
Aro Spotwelder Div., Guthery Machine Tool Corp., Long Island City, N. Y. 1692
Associated Spring Corp., Bristol, Conn. .. 1535
Atlantic Machine Tool Works Inc., Newington, Conn. 1549
Atlas Press Co., Kalamazoo, Mich. 1350
Atomic Energy Commission, Washington 1539

Automatic fastening is quick and economical with Townsend tubular rivets

You reduce material and unit costs, get quick, secure fastening of metals, plastics and fabrics with Townsend tubular rivets. Any degree of automation is possible, for these rivets feed smoothly in all makes of machines—they have the uniform physical properties and accurate dimensions essential to precise operations.

Townsend tubular rivets generally have a lower installed cost than any fastener—also the slight pressure required to set them prevents damage to soft or fragile material. When properly clinched they have great holding power—develop sheer strengths comparable to bulkier, more expensive fasteners.

Tubular rivets are light in weight—present an attractive appearance—add decorative appeal to many products. Townsend supplies these rivets in steel, brass, copper, aluminum, nickel-silver, and other special materials.

Quick delivery is assured by large stocks maintained in New Brighton, Pa.; Chicago; Santa Ana, Cal.; and Gananoque, Ontario. For information on how to increase fastening efficiency, write for Bulletin TL-103 to Townsend Company, P.O. Box 237-C, New Brighton, Pa.

The Fastening Authority

Townsend

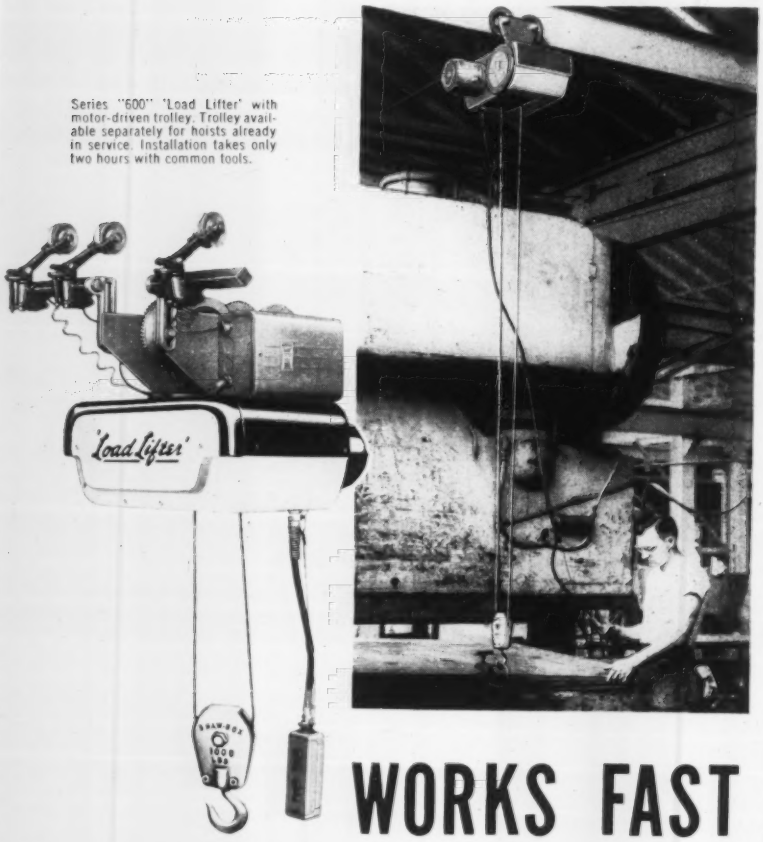
COMPANY • ESTABLISHED 1816

NEW BRIGHTON, PENNSYLVANIA

Sales Offices in Principal Cities

Cherry Rivet Division • Santa Ana, California

In Canada: *Parmenter & Bulloch Manufacturing Company, Ltd., Gananoque, Ontario*



Series "600" 'Load Lifter' with motor-driven trolley. Trolley available separately for hoists already in service. Installation takes only two hours with common tools.

WORKS FAST

TO HOLD DOWN PRODUCTION COSTS

A fast, rugged hoist is a "must" wherever loads up to a ton are lifted often in production. The Series "600" 'Load Lifter' Electric Hoist fills the bill exactly! A ½-ton load can be lifted at 30 FPM speed. The hoist has *two* automatic brakes that work together. This feature, plus handy push-button control, assures the quick action needed to "spot" loads accurately. And, the flexible wire rope saves time on narrow-angle side lifts.

Get more lifts per hour into *your* load-handling operations. Do it with the cost-cutting Series "600" 'Load Lifter' Electric Hoist. It has safe 24 volts at the push button and every other practical safeguard for man, load and hoist. Capacities: ½ and 1 ton. All types of suspension available to give you the utmost in efficiency and economy. Ask your "Shaw-Box" Distributor for details or write us for Bulletin 408.

56 F-2R

MAXWELL MANNING & MOORE INC. TRADE MARK

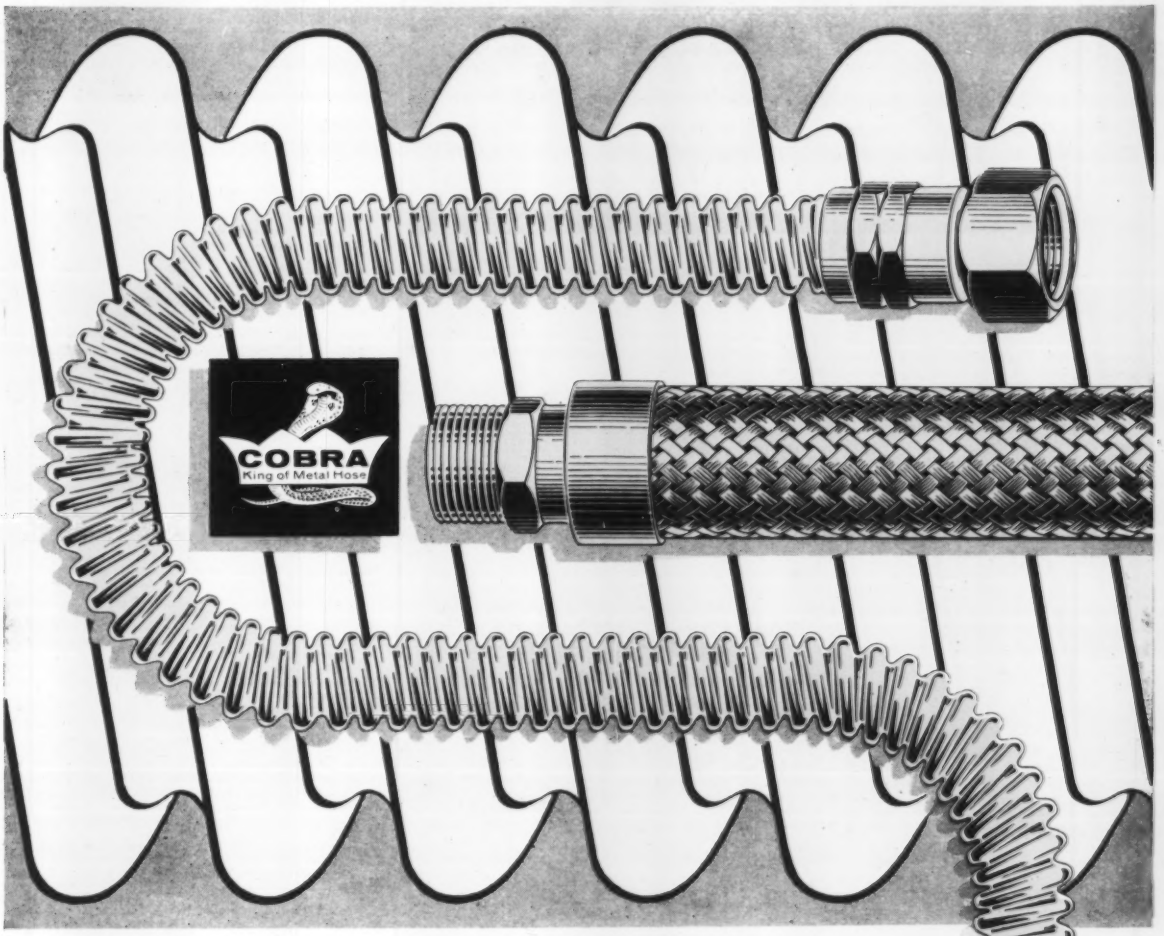
'Load Lifter'® ELECTRIC HOISTS

MANNING, MAXWELL & MOORE, INC.
SHAW-BOX CRANE & HOIST DIVISION
384 West Broadway • Muskegon, Michigan

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

In Canada: Manning, Maxwell & Moore of Canada, Ltd., Avenue Road, Galt, Ontario.

EXHIBITOR	BOOTH NO.
Audubon Wire Cloth Corp., Philadelphia	215
Automation, Cleveland	1028
Automation Instruments Inc., Pasadena, Calif.	153
Automotive Industries, Philadelphia	456
Babcock & Wilcox Co., Beaver Falls, Pa.	628
Baird-Atomic Inc., Cambridge, Mass.	265
Baker & Co. Inc., Newark, N. J.	119
Balcrank Inc., Cincinnati	1895
Baldwin-Lima-Hamilton Corp., Waltham, Mass.	1258
Ball Machinery Co., Chicago	448
Balteau Electric Corp., Stamford, Conn.	1373
Banner Welder Inc., Milwaukee	125
Barber-Colman Co., Rockford, Ill.	941
Barer Engineering & Machinery Co. Ltd., Montreal, Que.	502
Barry Controls Inc., Watertown, Mass.	1294
Bausch & Lomb Optical Co., Rochester, N. Y.	1054
Bede Products Corp., Amherst, Ohio	220
Bedford Gear & Machine Products Inc., Bedford, Ohio	129
Bendix Aviation Corp., Baltimore	1481
Beryllium Corp., Reading, Pa.	1688
Big Joe Mfg. Co., Chicago	136
Binks Mfg. Co., Chicago	1629
Bjorksten Research Laboratories for Industry Inc., Chicago	1893
Black & Decker Mfg. Co., Towson, Md.	241
Black Drill Co. Inc., Cleveland	419
G. S. Blakeslee & Co., Cicero, Ill.	1277
Bradley Washfountain Co., Miwaukee	1597
Branson Instruments Inc., Stamford, Conn.	1854
Branson Ultrasonic Corp., Stamford, Conn.	1854
Brinkmann Instruments Inc., Great Neck, N. Y.	835
British Industries Corp., Port Washington, N. Y.	1679
Charles Bruning Co. Inc., Chicago	1405
Brush Beryllium Co., Cleveland	531
Buck Mfg. Co., Los Gatos, Calif	1389
Buck Tool Co., Kalamazoo, Mich.	1036
Buda Div., Allis-Chalmers Mfg. Co., Milwaukee	935
Budd Co., Philadelphia	1715
Buehler Ltd., Evanston, Ill.	1235
C. I. T. Corp., New York	1741
Cam-Lok Div., Empire Products Inc., Cincinnati	1337
Campbell Machine Div., American Chain & Cable Inc., Bridgeport, Conn.	1849
Carlingo Commodities Corp., New York	1360
C. Robert Carlson Jr. Inc., a division of Overseas Commodex Corp., Detroit	1754
Carter Controls Inc., Lansing, Ill.	1794
Casting Engineers Inc., a division of Consolidated Foundries & Mfg. Co., Chicago	1794
Chainveyor Corp., Los Angeles	1826
Challenge Machinery Co., Grand Haven, Mich.	1059
Chicago Bridge & Iron Co., Chicago	1519
Chicago Foundry Co., Chicago	1689
Chicago Powdered Metal Products Co., Schiller Park, Ill.	1883
Chicago Rivet & Machine Co., Bellwood, Ill.	1835
Chicago Supply & Tool Co., Chicago	1456
Chilton Co., Philadelphia	456
Chrysler Corp., Detroit	1663
Cincinnati Milling & Grinding Machines Inc., Cincinnati	1798
Cincinnati Sub-Zero Products, Cincinnati	1583
Circo Equipment Co., Clark (Rahway), N. J.	1582
Robert H. Clark Co., Beverly Hills, Calif.	263
Clausing Div., Atlas Press Co., Kalamazoo, Mich.	1350
Clementina Ltd., San Francisco	1695
Cleveland Grinding Machine Co., Cleveland	860
Cleveland Metal Abrasive Co., Cleveland	831
Climax Molybdenum Co., New York	368
Coated Coil Corp., New York	1357
Cobalt Information Center, Battelle Memorial Institute, Columbus, Ohio	1314
Cold Metal Products Co., Youngstown	1127
Collins Microflat Co. Inc., Los Angeles	1880
Commander Mfg. Co., Chicago	1035
Commercial Shearing & Stamping Inc., Youngstown	1587
Consolidated Electrodynamics Corp., Rochester, N. Y.	1236
Consolidated Foundries & Mfg. Co., Chicago	1746
Continental Industrial Engineers Inc., Chicago	738
Cooke, Troughton & Simms Ltd., Chicago	1388
Cooper Metallurgical Associates, Cleveland	1579
Copper & Brass Research Assn., New York	1670
Copperweld Steel Co., Pittsburgh	526



Stoppers for vibration and noise start with **CHASE® BRASS TUBE**

In making their wide variety of metal hoses and flexible connectors, Cobra Metal Hose uses red brass tube made by Chase, "folds" it in their own special "Rafold" process, then treats and bright-dips the finished product. They report Chase tube assures vital elasticity and ease of working, consistently good grain structure, highly accurate temper and wall thickness—doesn't crack or separate in processing. Cobra reports an extra **"PLUS"** from Chase, too—technical help with production and metallurgical problems. This same help is ready to serve you—along with Chase alloys that are *right* to meet your specific needs. See Chase today, locally or at Waterbury 20, Connecticut.

Gas range connector, flexible nipple and vibration absorber made by Cobra Metal Hose of Chase red brass tube, using their special "Rafold" process and final bright-dipping.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass, Copper and Stainless Steel

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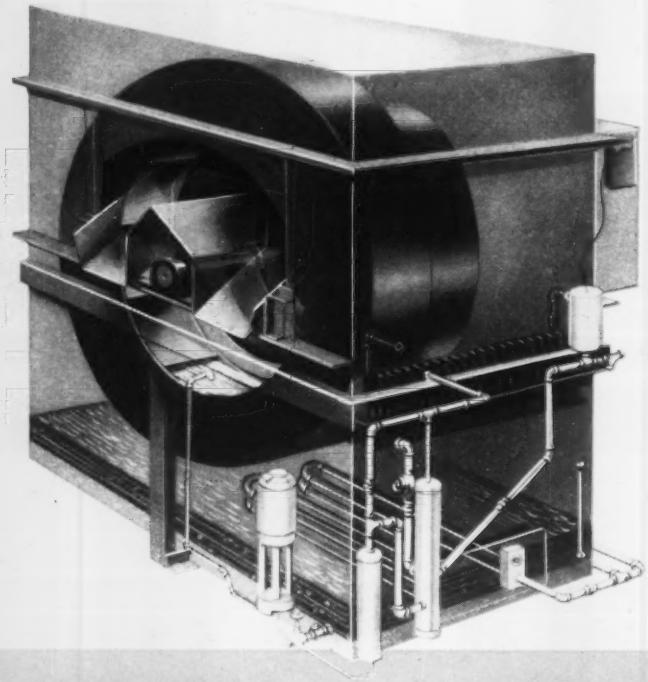
Revolutionary New Automated Degreaser by DETREX



Outstanding new type Rotary Drum Degreaser saves space, cuts costs, needs only small investment

Combining solvent degreasing with automated work handling, the new DETREX 1DD750 provides thorough cleaning of such products as nuts, bolts, fasteners, stampings and screw machine parts. In-process cleaning—cleaning before and after heat treatment—cleaning before plating, phosphatizing, bright dipping, etc. —final cleaning—all are handled with important savings in initial investment, operating costs and space requirements.

Steam heated and measuring only 6′ 6″ wide and 6′ 0″ high, and 4′ 0″ in direction of work flow, the 1DD750 handles five cubic feet per hour with a rated capacity of 2000 lbs. steel or brass per hour.

Only DETREX produces *both* equipment and chemicals to fill the widest range of metal cleaning and processing needs. DETREX can properly recommend, install and service the right combination of facilities for any cleaning application.

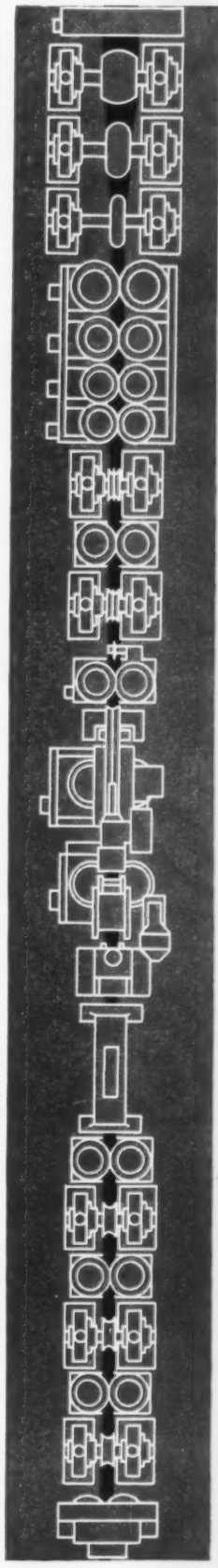
See Production Model of New DETREX 1DD750 in Operation at National Metal Exposition, International Amphitheatre, Chicago, November 4th through 8th, Booth No. 1316

DETREX CHEMICAL INDUSTRIES, INC.

BOX 501, DETROIT 32, MICHIGAN

EXHIBITOR	BOOTH NO.
Crane Packing Co., Morton Grove, Ill.	1240
Curtiss-Wright Corp., Wood-Ridge, N. J.	602
Cushman & Denison Mfg. Co. Inc., New York	1887
Cycledynamics Inc., Detroit	1593
Dake Corp., Grand Haven, Mich.	960
Daubert Chemical Co., Chicago	1664
A. P. De Sanno & Son Inc., Phoenixville, Pa.	1220
Designers Metal Corp., Harvey, Ill.	1756
Detrex Chemical Industries Inc., Detroit	1316
Detroit Testing Machine Co., Detroit	848
DeVilbiss Co., Toledo, Ohio	1708
DeWalt Inc., Lancaster, Pa.	1285
DeZurik Shower Co., Sartell, Minn.	1792
Diesel Control Corp., Wilmington, Calif.	1588
Henry Disston Div., H. K. Porter Company Inc., Philadelphia	1863
Diversey Corp., Chicago	147
DoAll Co., Des Plaines, Ill.	360
Documentation & Communication Research Center, Western Reserve University, Cleveland	560
Doehler-Jarvis Div., National Lead Co., Toledo, Ohio	1506
Dow Chemical Co., Midland, Mich.	1790
Wilbur B. Driver Co., Newark, N. J.	1257
Drop Forging Assn., Lansing, Mich.	1491
Dry Clime Corp., Greensburg, Ind.	1755
DuBois Co. Inc., Cincinnati	1393
Dumore Co., Racine, Wis.	1839
E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.	1845
Easco Products Div., Electro Arc Sales Co., Ypsilanti, Mich.	126
Eastman Kodak Co., Rochester, N. Y.	1429
Eclipse Fuel Engineering Co., Rockford, Ill.	735
Electric Furnace Co., Salem, Ohio	1135
Electro-Alloys Div., American Brake Shoe Co., Elyria, Ohio	336
Electro Arc Mfg. Co., Ypsilanti, Mich.	126
Electro Dynamic Div., General Dynamics Corp., Bayonne, N. J.	1642
Electromark Corp., Cleveland	1484
Electro Metallurgical Co., a division of Union Carbide Corp., New York	539
Empire Products Inc., Cincinnati	1337
Enamelstrip Corp., New York	1357
Engelhard Industries, Newark, N. J.	119
Engis Equipment Co., Chicago	1644
Etco Tool & Machine Co. Inc., Brooklyn, N. Y.	1487
Everite Machine Products Co., Philadelphia	1480
Exomet Inc., Conneaut, Ohio	1697
FabriSteel Products Inc., Detroit	1278
FAC Div., Overseas Commodex Corp., Detroit	1754
Fahralloy Co., Harvey, Ill.	144
Fairchild Engine & Airplane Corp., Hagerstown, Md.	915
Fansteel Metallurgical Corp., North Chicago, Ill.	1615
Fawick Airflex Div., Fawick Corp., Cleveland	855
Fawick Corp., Cleveland	855
Fenn Mfg. Co., Newington, Conn.	1250
Fenway Machine Co. Inc., Philadelphia	126
R. Y. Ferner Co. Inc., Malden, Mass.	1390
Firth Sterling Inc., Pittsburgh	1450
Flick-Reedy Corp., Melrose Park, Ill.	1660
Flinn & Dreffein Engineering Co., Chicago	137
Flow, Cleveland	1780
Foundry, Cleveland	1028
Foxboro Co., Foxboro, Mass.	1769
Friez Instrument Div., Bendix Aviation Corp., Baltimore	1481
Gaertner Scientific Corp., Chicago	1550
Garvin Bros. Inc., South Bend, Ind.	1282
Gas Appliance Service Inc., Chicago	754
Gaston Power Tools Div., R. M. Rumbold Co., Thornton, Ill.	137
General Alloys Co., Boston	548
General Dynamics Corp., New York	1642
General Fireproofing Co., Youngstown	435
General Ultrasonics Co., Hartford, Conn.	1219
Getchell Steel Treating Co. Inc., Minneapolis	1687
Goldsmith Bros. Smelting & Refining Co., Chicago	1022
B. F. Goodrich Aviation Products Div., B. F. Goodrich Co., Akron	347
Gray Co. Inc., Minneapolis	242
Grede Foundries Inc., Milwaukee	1637
Gregory Industries Inc., Lorain, Ohio	1476
Gries Reproducer Corp., New Rochelle, N. Y.	1343
Grotnes Machine Works Inc., Chicago	1592
Gulf Oil Corp., Pittsburgh	320
Guthery Machine Tool Corp., Long Island City, N. Y.	1692
Wm. J. Hacker & Co. Inc., New York	1254
Hammond Machinery Builders Inc., Kal-	

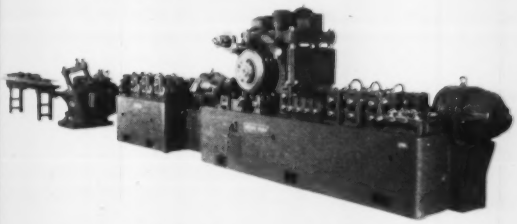
EXHIBITOR	BOOTH NO.
amazoo, Mich.	1311
Handy & Harman, New York	1415
Harmon & Co., Chicago	1587
Harper Electric Furnace Corp., Buffalo	409
H. M. Harper Co., Morton Grove, Ill.	1683
Harris Refrigeration Co., Cambridge, Mass.	1411
Hastings-Raydist Inc., Hampton, Va.	1785
Hauck Mfg. Co., Brooklyn, N. Y.	947
C. I. Hayes Inc., Cranston, R. I.	1306
Haynes Stellite Co., a division of Union Carbide Corp., Kokomo, Ind.	539
Heintz Mfg. Co., Philadelphia	1875
Heli-Coil Corp., Danbury, Conn.	216
Hevi-Duty Electric Co., Milwaukee	1819
High Vacuum Equipment Corp., Hingham, Mass.	1377
High Voltage Engineering Corp., Burlington, Mass.	325
Hitchiner Mfg. Co. Inc., Milford, N. H.	319
Hobart Bros. Co., Troy, Ohio	1251
Holcroft & Co., Detroit	819
Holger Andreasen Co., San Francisco	959
Charles A. Hones Inc., Baldwin, N. Y.	742
E. F. Houghton & Co., Philadelphia	1018
Howard Foundry Co., Chicago	927
Illinois Metal Products, Chicago	1680
Illinois Testing Laboratories Inc., Chicago	1353
Induction Heating Corp., Brooklyn, N. Y.	1207
Industrial & Commercial Gas Section, American Gas Assn., New York	735 & 754
Industrial Div., Minneapolis-Honeywell Regulator Co., Philadelphia	1042
Industrial Equipment News, New York	249
Industrial Furnace Div., Sunbeam Corp., Chicago	828
Industrial Heating, Pittsburgh	1441
Industrial Heating Equipment Co., Detroit	1558
Industrial Metals Div., American Silver Co., Flushing, N. Y.	815
Industrial Nucleonics Corp., Columbus, Ohio	1274
Industrial Press, New York	1361
Industrial Publishing Corp., Cleveland	1780
Industrial Tectonics Inc., Ann Arbor, Mich.	1121
Industry & Welding, Cleveland	1780
Instron Engineering Corp., Quincy, Mass.	1750
Instrument Div., American Optical Co., Buffalo	1047
Intercontinental Electronics Corp., Mineola, N. Y.	110
International Nickel Co. Inc., New York	542
Ionic Electrostatic Corp., Garfield, N. J.	301
Ipsen Industries Inc., Rockford, Ill.	1606
Iron Age, Philadelphia	456
Janney Cylinder Co., Philadelphia	1836
Jarrell-Ash Co., Newtonville, Mass.	1830
Jiffy Disintegrators Inc., Royal Oak, Mich.	1575
I. O. Johansson Co., Skokie, Ill.	928
S. C. Johnson & Son Inc., Racine, Wis.	1530
Jomac Inc., Philadelphia	1698
Kanthal Corp., Stamford, Conn.	842
C. M. Kemp Mfg. Co., Baltimore	727
Kennametal Inc., Latrobe, Pa.	1529
Keokuk Steel Casting Co., Keokuk, Iowa	1396
L. R. Kerns Co., Chicago	235
King Tester Corp., Philadelphia	924
Kinney Mfg. Div., New York Air Brake Co., Boston	1459
Kirksite Tool & Engineering Div., National Lead Co., New York	1506
Knight Models Inc., Chicago	1650
Kolcast Industries Inc., Cleveland	1326
Korhumel Steel & Aluminum Co., Evanston, Ill.	226
Kux Machine Co., Chicago	1659
L & L Mfg. Co., Upland, Pa.	1284
Laboratory Equipment Corp., St. Joseph, Mich.	1286
Lake Chemical Co., Chicago	1443
K. O. Lee Co., Aberdeen, S. Dak.	1397
Leeds & Northrup Co., Philadelphia	865
LeFiell Mfg. Co., Los Angeles	114
E. Leitz Inc., New York	1231
Lempco Industrial Inc., Bedford, Ohio	1740
Leonard Precision Products Co., Santa Ana, Calif.	954
Lepel High Frequency Laboratories Inc., Woodside, N. Y.	1848
Lewis Machine Co., Cleveland	1418
Light Metals Dept., American Brake Shoe Co., New York	336
Lindberg Engineering Co., Chicago	620
Linde Co., a division of Union Carbide Corp., New York	539
Link Engineering Co., Detroit	428
Lobeck Casting Processes Inc., New York	1649
Loma Machine Mfg. Co. Inc., New York	1649
Lufkin Rule Co., Saginaw, Mich.	1807
Lynchburg Foundry Co., Lynchburg, Va.	920



ETNA TUBE MILLS

feature a Universal Drive that has the advantages of (1) adaptability to roll methods; (2) adjustable lower spindle; (3) fast change-over, and (4) completely sealed gearing.

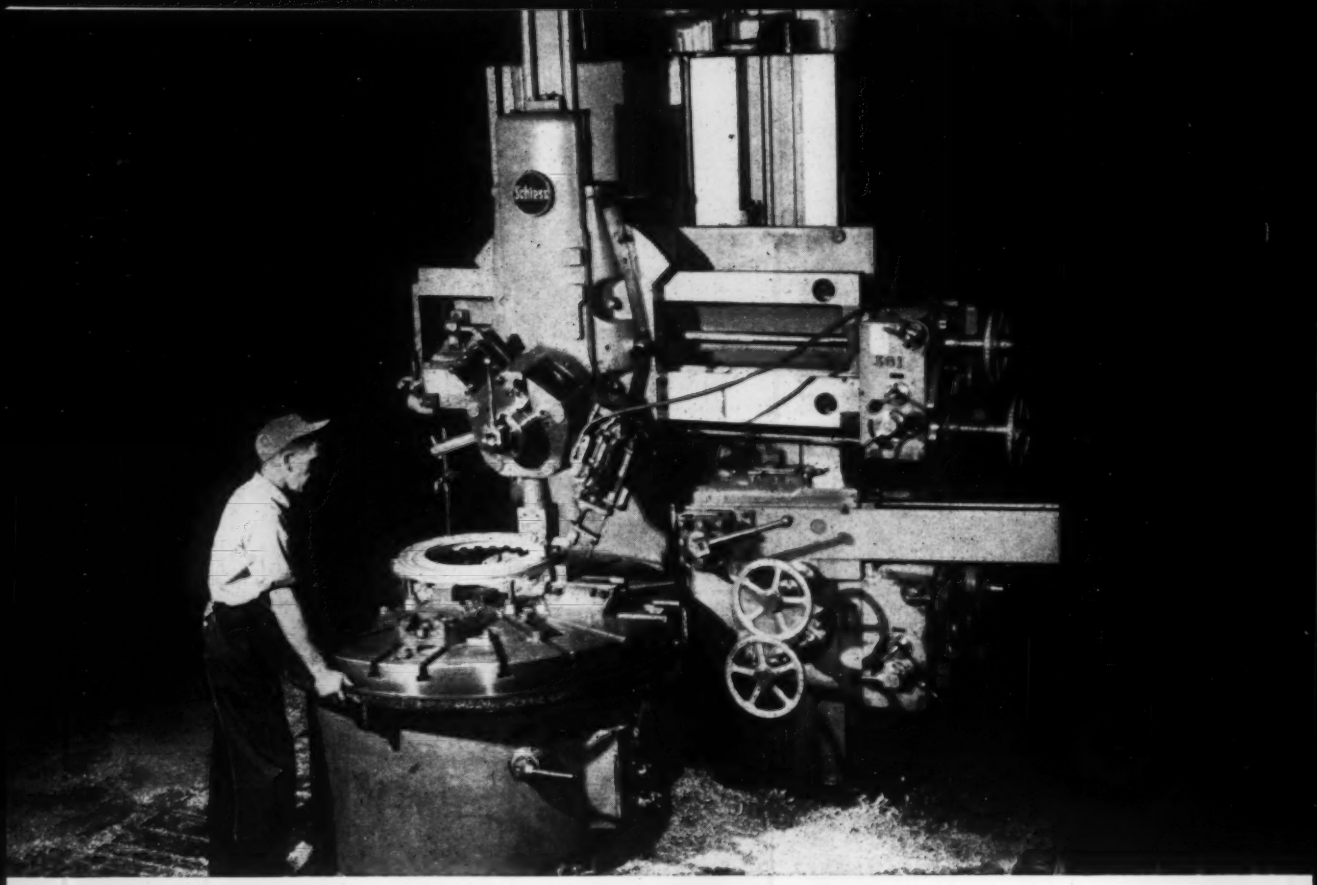
FOR WELDED TUBE AND PIPE OF STEEL, COPPER, ALUMINUM, STAINLESS STEEL. Sizes from 5/16 OD - .022 wall to 16 OD - .500 wall.



SWAGING MACHINES • TUBE CUT-OFF MACHINES • ALLIED EQUIPMENT

Abbey ETNA COMPANY

811 E. INDIANA AVENUE • PERRYSBURG, OHIO



"Now, with our Schiess vertical turret lathe

one 8-hour shift does the work of three!"

says Arnold R. Kline, plant manager, O.K. Rubber, Inc., Littleton, Colo.

Schiess 13EK-150 Vertical Turret Lathe turning a 33 in. "Nu-Matic" tire mold sidewall plate, made of #12 cast aluminum.

"Production on sidewall tire molds jumped 300%. Material spoilage was reduced 50 to 60%. Per unit cost dropped 60%. And we have a better machined end product!" That's the way Arnold Kline wraps up the production story at O.K. Rubber, since he installed this Schiess machine.

He continues: "We've got the Schiess mill doing everything from boring 1¼ in. holes to turning plates 56 in. in diameter. We thought we'd need a custom-made mill to do our kind of work. We don't think that way any more."

"And frankly, we were amazed at the price—30 to 40% lower than we expected!"

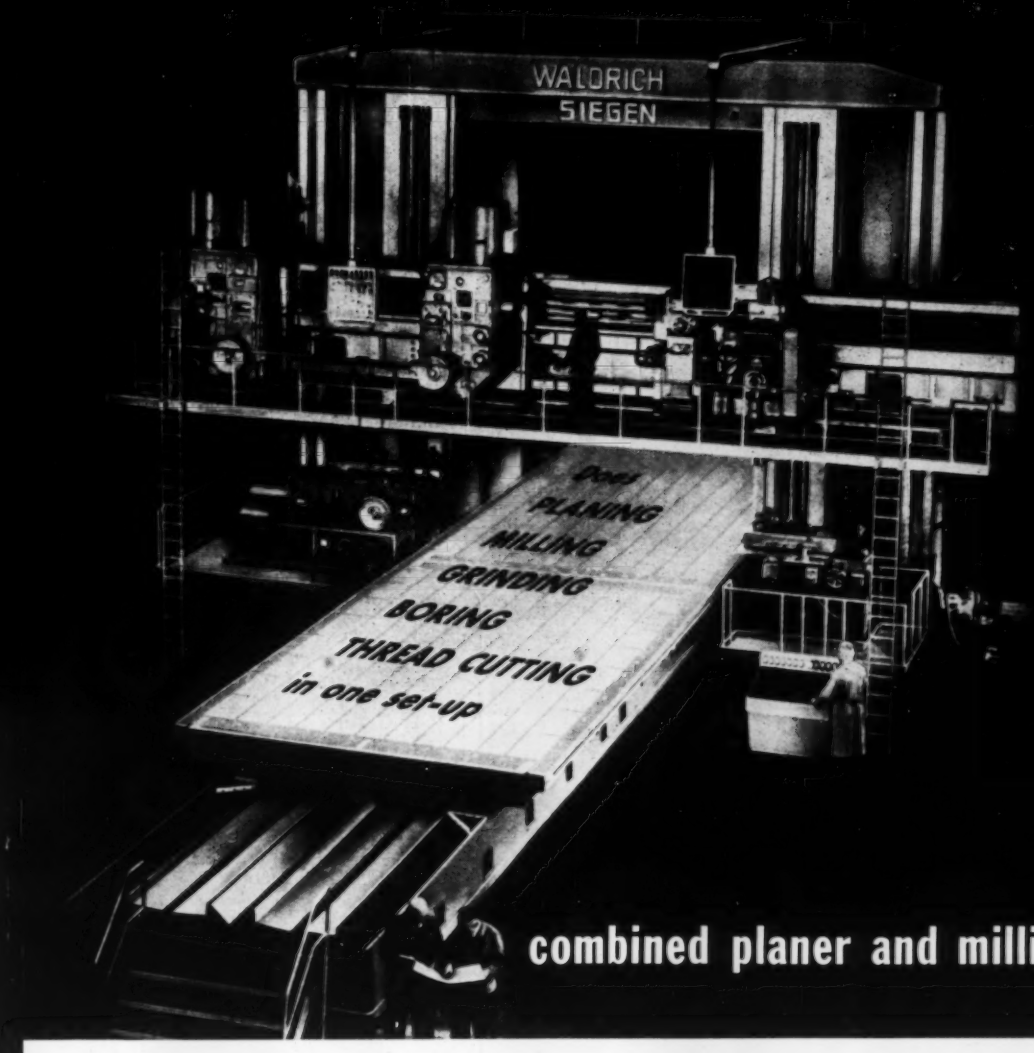
No costly training time was needed. Skilled machinists were checked out on the mill in just a few hours. Operators particularly liked the horizontal head, the rapid traverse lever, the cross-rail mechanical controls. All contributing to greater accuracy . . . better finish . . . less machining time.

Get to know this and other products of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess engineer will be happy to help you select the proper tool for your production needs. Write today.

SCHIESS

AMERICAN SCHIESS CORPORATION • 1232 Penn Avenue, Pittsburgh 22, Pa.

this 480 ton giant has 5 heads



WALDRICH SIEGEN

combined planer and milling machine

No need to risk the inaccuracies that come from moving a workpiece weighing up to 100 tons from machine to machine for different operations. One set-up is all you need with this Waldrich Siegen machine. And just think of the tremendous savings in set-up time and costs.

Three milling heads take care of milling, boring and thread cutting operations; another head does planing and grinding; and there's a planer side head, too.

The Waldrich patented tool retracting mechanism in the planer head raises tool in a straight vertical plane after unclamping, repositions tool automatically, then reclamps. Cross rail is clamped hydraulically in exact horizontal position, located by separate electric drive. Built-in optics confirm accurate location.

Rigid, you bet—from top to bottom! Waldrich construction features a base plate crossing under machine and tying columns and bed into one ruggedly rigid unit. And there's a total of 900 h.p. working for you.

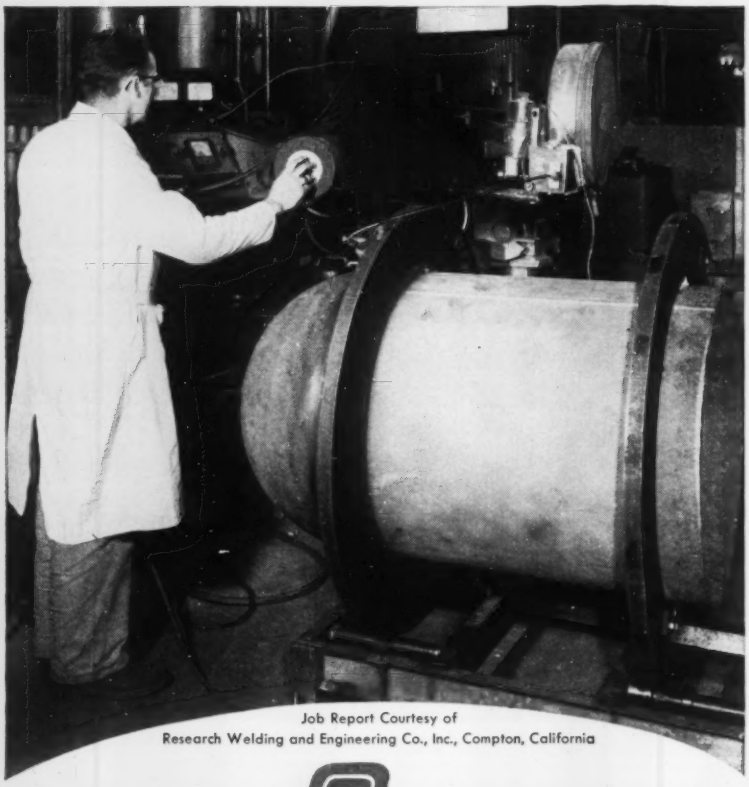
Write for all the specs on this mammoth producer. And ask a Waldrich engineer to discuss them in detail—in terms of your production needs.

WALDRICH SIEGEN

american waldrich mfg. corp.

1232 PENN AVENUE, PITTSBURGH 22, PENNSYLVANIA

Weld from one side only . . .
Get X-ray quality welds



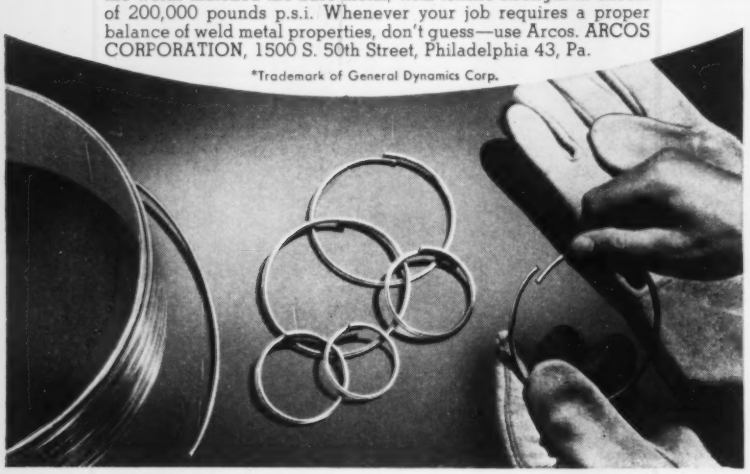
Job Report Courtesy of
Research Welding and Engineering Co., Inc., Compton, California

USE THE ARCOS

EB* WELD INSERT

This welded missile tank had to weigh less than 600 pounds and yet contain air under pressure of 3,000 p.s.i. Arcos EB* Consumable Weld Inserts were used in automatic inert gas arc welding of the dished heads to the tank body. The inserts saved weight by eliminating back-up rings. They also allowed welding to be done conveniently from one side only and produced 100% x-ray quality root passes. Chromenar CMV coiled wire for submerged arc welding was used to complete the welds. After heat treatment the welds matched the base metal, with tensile strength in excess of 200,000 pounds p.s.i. Whenever your job requires a proper balance of weld metal properties, don't guess—use Arcos. ARCOS CORPORATION, 1500 S. 50th Street, Philadelphia 43, Pa.

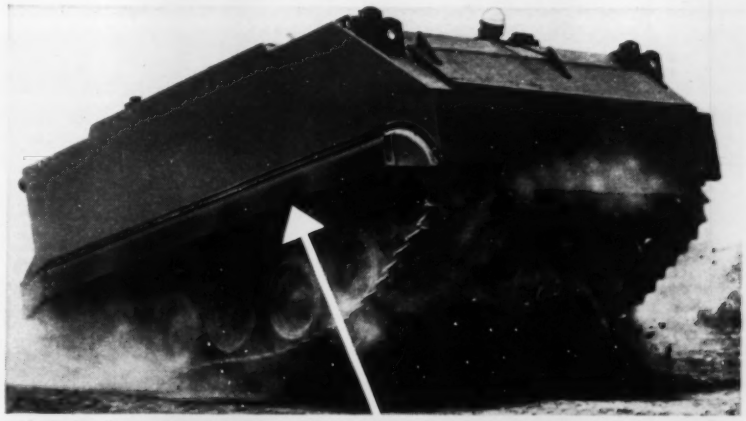
*Trademark of General Dynamics Corp.



EXHIBITOR	BOOTH NO.
M. B. I. Export & Import Ltd., New York	316
Machine Design, Cleveland	1028
Machinery, New York	1361
Magnaflux Corp., Chicago	1153
Magnetic Analysis Corp., Long Island City, N. Y.	948
Malayan Tin Bureau, Washington	341
Mallory-Sharon Titanium Corp., Niles, Ohio	1525
Man-Au-Cycle Corp. of America, Brooklyn, N. Y.	1550
Manco Mfg. Co., Bradley, Ill.	847
Manufacturers Processing Co., Detroit	1844
Marine Pumps Inc., a division of Diesel Control Corp., Wilmington, Calif.	1588
Markal Co., Chicago	1443
Martindale Electric Co., Cleveland	1292
Maserati Corp. of America, Westbury, N. Y.	1605
McGraw-Hill Publishing Co., New York	109
Mead Specialties Co. Inc., Chicago	1040
Melray Mfg. Co., Franklin Park, Ill.	1857
Metal Chemicals Section, American Cyanamid Co., New York	1815
Metal Finishing Service, Chicago	1492
Metal Lubricants Co., Chicago	1788
Metal Powder Assn., New York	619
Metal Progress, Cleveland	553
Metal Removal Co., Chicago	1667
Metallizing Co. of America, Chicago	1868
Metallizing Engineering Co. Inc., Westbury, N. Y.	1760
Metallurgical Products Dept., General Electric Co., Detroit	1368
Metals Engineering Institute, Cleveland	553
Metals Review, Cleveland	553
Metalwash Machinery Corp., Elizabeth, N. J.	734
Metalworking Publishing Co. Inc., Boston	1891
Met-L-Chek Co., Pittsburgh	1385
Michigan Standard Alloy Casting Co., a division of Ebaloy Inc., Detroit	1446
Micrometrical Mfg. Co., Ann Arbor, Mich.	1227
Milband Div., Henry G. Thompson & Son Co., New Haven, Conn.	1545
Miller Fluid Power Div., Flick-Reedy Corp., Melrose Park, Ill.	1660
Minneapolis-Honeywell Regulator Co., Minneapolis	1042
Minnesota Mining & Mfg. Co., St. Paul	1212
Mitchell Radiation Products Corp., Norristown, Pa.	1385
Mitts & Merrill Inc., Saginaw, Mich.	1479
Modernair Corp., San Leandro, Calif.	1879
Modern Industrial Press, Chicago	217
Modern Railroads, Chicago	217
Monarch Tools Inc., a division of Rankin Bros. Engineering & Sales Inc., Lynwood, Calif.	1682
Morehouse Industries, Los Angeles	1382
NRC Equipment Corp., Cambridge, Mass.	1426
National Carbon Co., a division of Union Carbide Corp., New York	539
National Distillers & Chemical Corp., New York	1525
National Lead Co., New York	1506
National Malleable & Steel Castings Co., Cleveland	1735
National Metal Abrasive Co., Cleveland	1289
National Plating & Processing Co., San Diego, Calif.	1295
National Research Corp., Cambridge, Mass.	1426
National-Standard Co., Secaucus, N. J.	1745
National-U. S. Radiator Corp., Johnstown, Pa.	625
National X-Ray Products Corp., Hackensack, N. J.	1872
Nelson Stud Welding Div., Gregory Industries Inc., Lorain, Ohio	1476
New Equipment Digest, Cleveland	1028
New Hermes Engraving Machine Corp., New York	1339
New York Air Brake Co., New York	1459
North American Philips Co. Inc., New York	1630
North American-Viking Drill Co., St. Paul	1335
Nuclear Systems Div., Budd Co., Philadelphia	1715
Oakite Products Inc., New York	247
Ohio Crankshaft Co., Cleveland	236
Ohio Seamless Tube Div., Copperweld Steel Co., Shelby, Ohio	526
Oil-Dyne Inc., Chicago	219
Tinius Olsen Testing Machine Co., Willow Grove, Pa.	1346
Opplem Co. Inc., East Rutherford, N. J.	1288
Opto-Metric Tools Inc., New York	1223
Oregon Metallurgical Corp., Albany, Oreg.	430
Osborn Mfg. Co., Cleveland	1330
Overseas Commodex Corp., Detroit	1754
Pacific Industrial Mfg. Co., Oakland, Calif.	1576
Pangborn Corp., Hagerstown, Md.	1263
Pantex Mfg. Corp., Pawtucket, R. I.	1598
Park Chemical Co., Detroit	637

EXHIBITOR	BOOTH NO.
Charles Parker Co., Meriden, Conn	841
Geo. C. Patterson Machine Co., Cleveland	1522
Pedrick Tool & Machine Co., Philadelphia	1853
Penn Precision Products Inc., Reading, Pa.	120
Penton Publishing Co., Cleveland	1028
Perkins Machine Co., Warren, Mass.	1811
Petersen Oven Co., Franklin Park, Ill.	1291
Phillips Electronics Inc., Mt. Vernon, N. Y.	825
Phillips Mfg. Co., Chicago	825
Picker X-Ray Corp., White Plains, N. Y.	959
Pines Engineering Co. Inc., Aurora, Ill.	1675
Pioneer Aluminum Inc., Los Angeles	1506
Plastic Metals Div., National-U. S. Radiator Corp., Johnstown, Pa.	625
Plew Tool Co. Inc., Ft. Wayne, Ind.	315
H. K. Porter Company Inc., Pittsburgh	1863
Portomag Inc., Ferndale, Mich.	1159
Powdered Metal Products Div., Yale & Towne Mfg. Co., Franklin Park, Ill.	1776
Precision Extrusions, Bensenville, Ill.	118
Precision Metal Molding, Cleveland	1780
Pressco Casting & Mfg. Corp., Chesterton, Ind.	142
Process Machinery Div., Cincinnati Milling Machine Co., Cincinnati	1798
Production Equipment, Chicago	1488
Production Machine Co., Greenfield, Mass.	210
Prutton Corp., Cleveland	1522
Punch Products Corp., Niagara Falls, N. Y.	1759
Pyrometer Instrument Co. Inc., Bergenfield, N. J.	1744
Radio Corp. of America, Camden, N. J.	1494
Rankin Bros. Engineering & Sales Inc., Lynwood, Calif.	1684
Ransburg Electro-Coating Corp., Indianapolis	160
Reactive Metals Inc., New York	1525
Rebuilders Machinery Sales Inc., Chicago	928
Reliance Electric & Engineering Co., Cleveland	1656
J. A. Richards Co., Kalamazoo, Mich.	1497
Riehle Testing Machines Div., American Machine & Metals Inc., East Moline, Ill.	820
Rochester Div., Consolidated Electrodynamics Corp., Rochester, N. Y.	1236
Rothern Engineering Co. Inc., Chicago	1290
R. M. Rumbold Co., Thornton, Ill.	137
Joseph T. Ryerson & Son Inc., Chicago	636
S & S Machinery Co., Brooklyn, N. Y.	1559
Salkover Metal Processing of Illinois Inc., Chicago	140
Sandex Automation Inc., Brooklyn, N. Y.	1585
Sandusky Foundry & Machine Co., Sandusky, Ohio	1731
George Scherr & Co., New York	1550
Scientific Electric Co., Garfield, N. J.	301
Scott Paper Co., Chester, Pa.	1890
Scully-Jones & Co., Chicago	1791
Selas Corp. of America, Dresher, Pa.	718
Sentry Co., Foxboro, Mass.	150
Service Diamond Tool Co., Ferndale, Mich.	1341
Service Machine Co., Chicago	1759
Sheffield Corp., Dayton, Ohio	1645
Sheldon Machine Co. Inc., Chicago	1864
Shell Oil Co., New York	310
Sieburg Industries Inc., New Britain, Conn.	1783
Sinclair Refining Co., New York	1475
SKIL Corp., Chicago	1787
Smith Welding Equipment Corp., Minneapolis	1867
Socony Mobil Oil Co. Inc., New York	1676
South Chester Corp., Lester, Pa.	1027
Southco Div., South Chester Corp., Lester, Pa.	1027
Special Libraries Assn., Chicago	1515
Special Machinery & Engineering Inc., Detroit	1386
Special Products Div., American Cast Iron Pipe Co., Birmingham	1376
Spee-Flo Co., Houston	1798
Spencer Turbine Co., Hartford, Conn.	723
Sperry Products Inc., Danbury, Conn.	1053
Spitfire Tool Co., Chicago	1636
Stanat Mfg. Co., Westbury, N. Y.	1442
Standard Electrical Tool Co., Cincinnati	1641
Standard Oil Co. (Indiana), Chicago	1564
Stanley Electric Tool Div., Stanley Works, New Britain, Conn.	1876
Stanley Works, New Britain, Conn.	1876
Star Expansion Industries Corp., New York	1380
Starlite Industries, Philadelphia	1889
L. S. Starrett Co., Athol, Mass.	1730
STEEL, Cleveland	1028
Steel City Testing Machines Inc., Detroit	1729
Steel Sales Corp., Chicago	530
Edwin B. Stimpson Co. Inc., Brooklyn, N. Y.	342
F. J. Stokes Corp., Philadelphia	631
Strip Steel Div., Jones & Laughlin Steel Corp., Pittsburgh	1127

How to produce low alloy welds to resist tons of torture

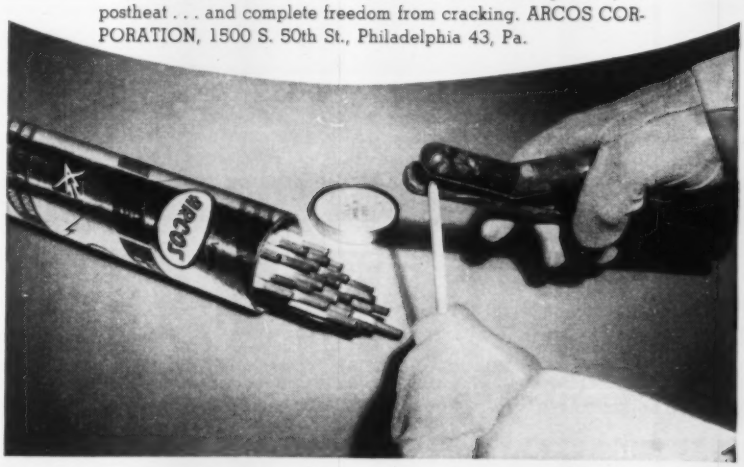


Job Report Courtesy of
Food Machinery and Chemical Co.
Ordnance Division, San Jose, Calif.

WELD WITH ARCOS

LOW ALLOY ELECTRODES

This 22½ ton armored personnel carrier proves an important point. When working with hard-to-weld low-alloy plate, and welds must be extra strong and tough in the "as welded" condition, it pays to use the highest quality weld metal available. In this case, Arcos Tensilend 100, a low hydrogen coated electrode produced weld metal that matched the physical and chemical properties of the base metal. In addition, it did the job with less nickel than the 19-9 modified electrode formerly used. There was no preheat, no postheat . . . and complete freedom from cracking. ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.



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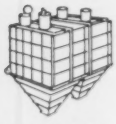
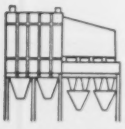
...year after year!

Buell Cyclone collectors pay off two ways: extra efficiency from the start . . . and extra years of operation, with little if any maintenance. Unique features like Buell's exclusive Shave-off deliver an extra percentage of dust collection efficiency: in nearly all cases, Buell installations pay for themselves in just a few years. And heavy plate construction, scientific proportioning, side entry of dust-laden gases are reasons why they keep on earning for many, many years. For specific details, write for "The Collection and Recovery of Industrial Dusts". Just write Dept. 26-J, Buell Engineering Company, Inc., 70 Pine Street, New York 5, N. Y.

BUELL CYCLONE



"SF" ELECTRIC PRECIPITATOR



PRECIPITATOR-CYCLONE COMBINATION

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Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

EXHIBITOR	BOOTH NO.
Stroman Furnace & Engineering Co., Franklin Park, Ill.	1291
Sun Steel Co., Chicago	1591
Sunbeam Corp., Chicago	828
Sunnen Service Corp., St. Louis	1490
Superior Tube Co., Norristown, Pa.	209
Supreme Products Corp., Chicago	1861
Surface Combustion Corp., Toledo, Ohio	516
Swedish Crucible Steel Co., Detroit	1843
Tapmatic Corp., Costa Mesa, Calif.	1859
Tatnall Measuring Systems Co., Philadelphia	1715
Taylor Instrument Co., Rochester, N. Y.	1885
Technic Inc., Providence, R. I.	1025
Tempil® Corp., New York	1041
Tensilkut Div., Sieburg Industries Inc., New Britain, Conn.	1783
The Texas Co., New York	365
Thomas Publishing Co., New York	249
Thomas' Register of American Manufacturers, New York	249
Henry G. Thompson & Son Co., New Haven, Conn.	1545
Thor Power Tool Co., Chicago	436
Arthur Tickle Engineering Works Inc., Brooklyn, N. Y.	919
Timesaver Products Co. of Illinois, Chicago	1342
Tin Research Institute Inc., Columbus, Ohio	1048
Tinnerman Products Inc., Cleveland	1568
Titanium Metals Corp. of America, New York	260
Tocco Div., Ohio Crankshaft Co., Cleveland	236
Torrington Mfg. Co., Torrington, Conn.	1567
Torsion Balance Co., Clifton, N. J.	936
Triplett & Barton Inc., Burbank, Calif.	1829
Tru-Seal Div., Flick-Reedy Corp., Melrose Park, Ill.	1660
Tubular Micrometer Co., St. James, Minn.	1550
Tubular Rivet & Stud Co., Wollaston, Mass.	1779
Turco Products Inc., Los Angeles	1367
Uddeholm Co. of America Inc., New York	942
Union Carbide Corp., New York	539
Union Mfg. Co., New Britain, Conn.	841
Unit Process Assemblies Inc., New York	1023
United Scientific Co., Boston	1736
U. S. Chemical Milling Corp., Manhattan Beach, Calif.	426
U. S. Department of Commerce, Washington	1555
U. S. Electrical Motors Inc., Chicago	1268
United States Gypsum Co., Chicago	1724
U. S. Industrial Chemicals Co., New York	1525
Universal Castings Corp., Chicago	1652
Universal Construction Kits, Detroit	1754
Universal-Cyclops Steel Corp., Bridgeville, Pa.	1546
Universal Gear Works Inc., Detroit	1230
Upton Electric Furnace Co., Roseville, Mich.	641
Utility Supply Co., Chicago	1486
Vacuum Equipment Div., New York Air Brake Co., New York	1459
Vanadium-Alloys Steel Co., Latrobe, Pa.	326
Vanadium Corp. of America, New York	854
Vanguard Engineering Co., Cleveland	1841
Vapor Blast Mfg. Co., Milwaukee	1394
Vascoloy-Ramet Corp., Waukegan, Ill.	1615
Waldes Truarc Retaining Ring Div., Waldes Kohinoor Inc., Long Island City, N. Y.	836
Waldes Kohinoor Inc., Long Island City, N. Y.	836
Wales-Strippit Corp., Akron, N. Y.	1749
Watson Publications Inc., Chicago	217
Waukee Engineering Co. Inc., Milwaukee	1842
Weatherhead Co., Ft. Wayne, Ind.	315
Welding Illustrated, Cleveland	1780
Wells Mfg. Co., Three Rivers, Mich.	1775
Weltronic Co., Detroit	1860
Western Gold & Platinum Co., Newark, N. J.	1257
West Instrument Co., Chicago	1060
Westinghouse Electric Corp., Pittsburgh	1616
Weston Electrical Instrument Corp., Newark, N. J.	248
Wheelabrator Corp., Mishawaka, Ind.	1430
Wheelco Instrument Div., Barber-Colman Co., Rockford, Ill.	941
Wilson-Carr Inc., Chicago	1488
Wilson Mechanical Instrument Div., American Chain & Cable Co. Inc., Bridgeport, Conn.	953
Wire Machinery Inc., Chicago	1522
Yale & Towne Mfg. Co., New York	1776
Zaco Laboratories Div., Zip Abrasive Co., Cleveland	139
Carl Zeiss Inc., New York	965
Zenith Foundry Co., West Allis, Wis.	1137
Ziv Steel & Wire Co., Chicago	1381

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Chicago, Ill.	Indianapolis, Ind.	Toledo, Ohio	Milwaukee, Wis.
Cincinnati, Ohio	Los Angeles, Calif.	Toronto, Ontario	St. Louis, Mo.
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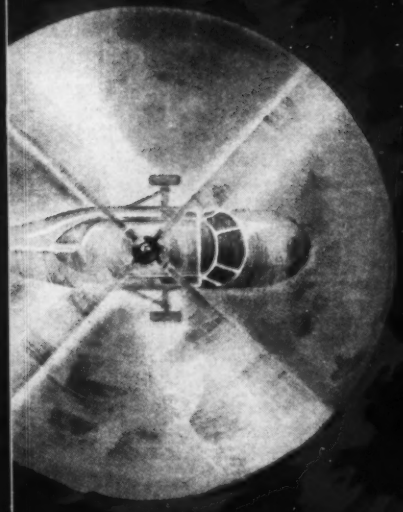

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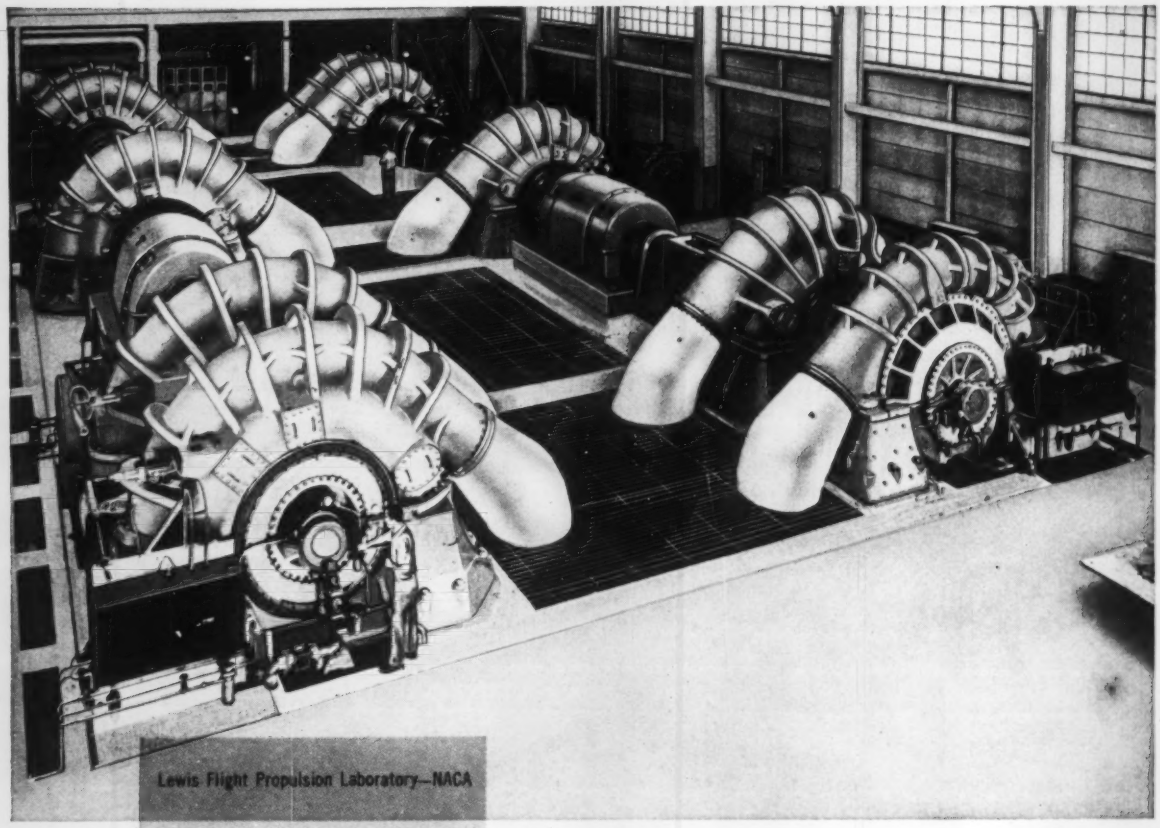

Lewis Flight Propulsion Laboratory—NACA

How one of the world's largest wind tunnels can help an iron and steel man!

Roots-Connersville supplies a complete line of air and gas handling equipment . . . centrifugal, Spiraxial® and rotary positive blowers, exhausters and compressors . . . rotary positive gas pumps and meters . . . rotary vacuum pumps . . . for manufacturing and process industries.

From violent, roaring cyclones of air to silent, almost perfect vacuums . . .

atmospheres "in the mass" are created and precisely controlled to order by these giant Roots-Connersville centrifugal blowers at Lewis Flight Propulsion Laboratory in Cleveland, Ohio.

In solving unusual air and gas handling problems such as this, Roots-Connersville draws on a highly developed engineering and manufacturing skill. For over 100 years, R-C equipment has been meeting the most exacting requirements of industry around the world.

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On Display at the Show

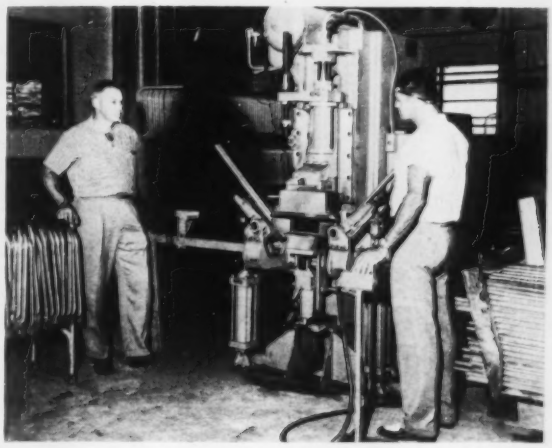
Tube Bending Press Can Make up to 1000 Frames an Hour

Model 6-T is designed to form U-frames having two bends, such as are commonly found on chair backs. The press can also be used for making single bends. It forms steel or aluminum tubes, two at a time.

The distance between die centers is adjustable for different size frames. Maximum capacity when bending two tubes is 1-in. OD steel with a 0.065-in. wall.

Wrinkle free bends can be made in 1-in. OD steel tubing to a 2½-in. centerline radius. Steel tubing ⅞ in. in outside diameter can be formed to a 1½-in. centerline radius.

The two bends in a frame can be made to different angles. If there are two 90-degree bends, collapsible dies are used so that the finished parts are released from the die grooves quickly. *Write*: Pines Engineering Co. Inc., 601 Walnut St., Aurora, Ill. *Phone*: Aurora 6-7701 (Metal Show Booth 1675)



Rotary Drum Degreaser Handles a Wide Range of Operations

Nuts, bolts, fasteners, stampings, and screw machine parts are cleaned thoroughly by Model 1DD750. This machine combines solvent degreasing with automated work handling.

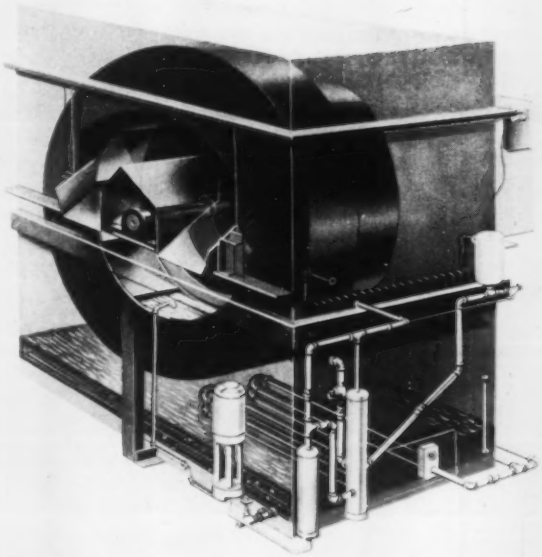
In-process cleaning; cleaning before heat treatment; cleaning before plating, phosphatizing, bright dipping, etc.; and final cleaning are done by the machine.

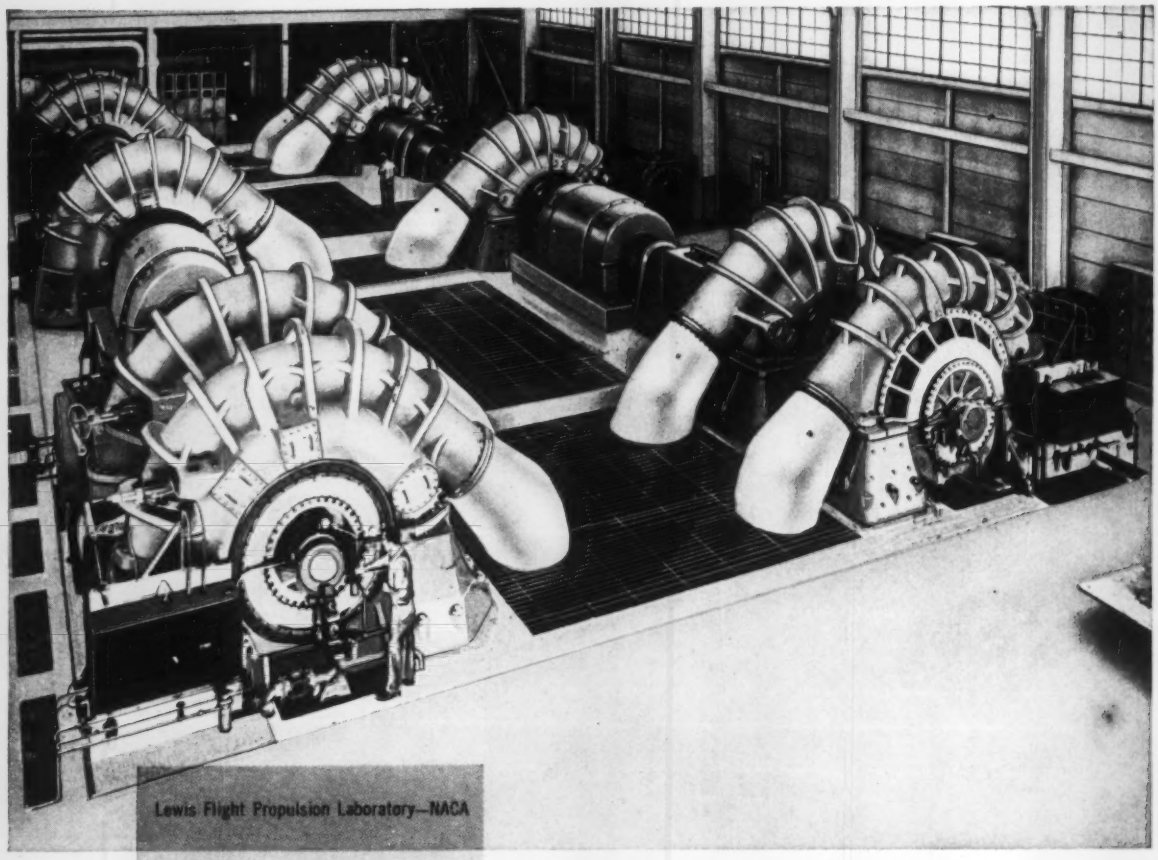
The steam heated unit is 6½ ft wide, 6 ft high, and 4 ft in the direction of the work flow.

The degreaser handles 5 cu ft an hour. Rated capacity is 2000 lb of steel or brass parts an hour.

Parts to be cleaned enter the degreaser through a conventional chute. They are carried through the machine by a screw-type drum which tumbles the parts, subjects them to vapor and immersion cleaning, final vapor rinse, and drying.

The parts are then discharged through a chute on the opposite side of the machine. *Write*: Detrex Chemical Industries Inc., Box 501, Roosevelt Park Annex, Detroit 32, Mich. *Phone*: Townsend 8-8600 (Metal Show Booth 1316)





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From violent, roaring cyclones of air to silent, almost perfect vacuums . . .

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In solving unusual air and gas handling problems such as this, Roots-Connersville draws on a highly developed engineering and manufacturing skill. For over 100 years, R-C equipment has been meeting the most exacting requirements of industry around the world.

Roots-Connersville, one of the Dresser Industries, will be glad to put its broad knowledge and experience to work for you. Your problem will receive immediate attention from our Application Engineering Department.

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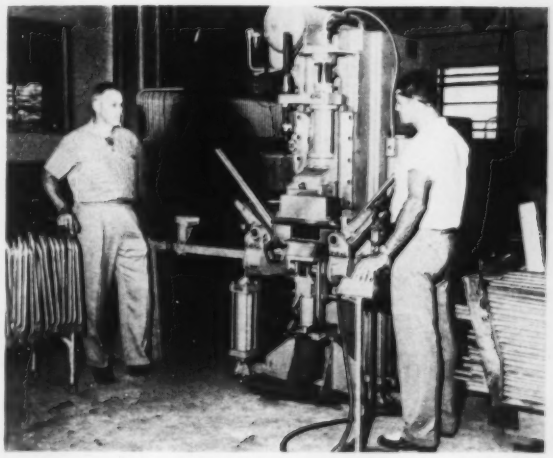

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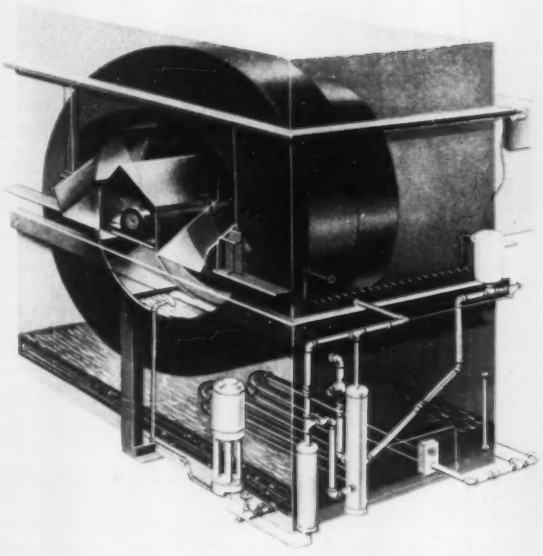
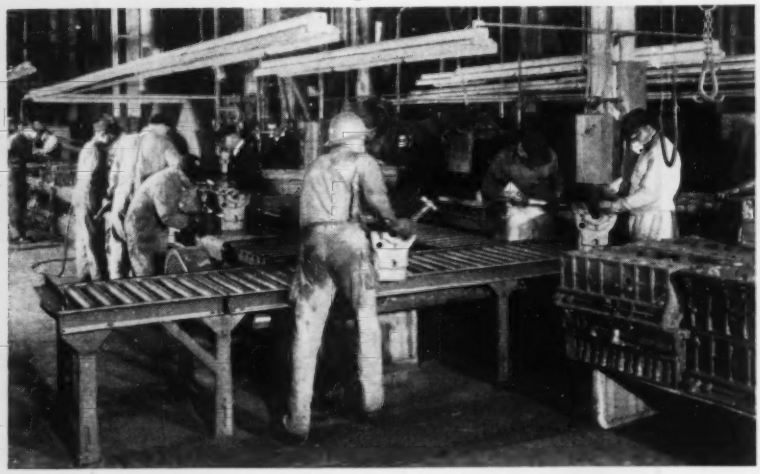


Ask Standard

how to cut costs with conveyors



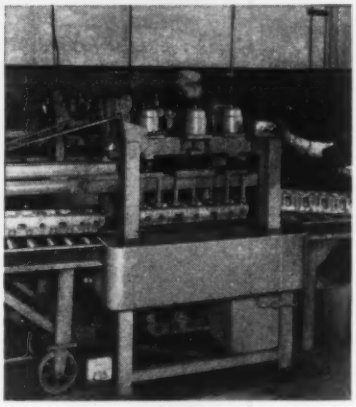
Cylinder blocks are chipped, ground and inspected on Standard Roller Conveyor line.

Eastern foundry simplifies cylinder block handling with roller conveyors

HERE'S another installation in which Standard Roller Conveyors are keeping heavy, bulky components flowing to machining and assembly points with minimum manpower and practically no time loss.

Easy to set up and exceptionally sturdy, Standard Roller Conveyors (live or gravity) can also be job-tailored to your specific materials handling problem — permanent or temporary.

And roller conveyors are only one of the many types of Standard conveyors. Others include belt, slat, chain, pushbar or sectional conveyors as well as spiral chute systems.



Standard Roller Conveyors are available from stock in a wide range of roller diameters, centers and frames.

Call the Standard engineer listed in your classified phone book or write direct for Bulletin 68 — Address Dept. Y-10.

Why not take advantage of Standard's half-century of conveyor application experience. Consult STANDARD CONVEYOR COMPANY. General offices: North St. Paul 9, Minnesota. Sales and service in principal cities.

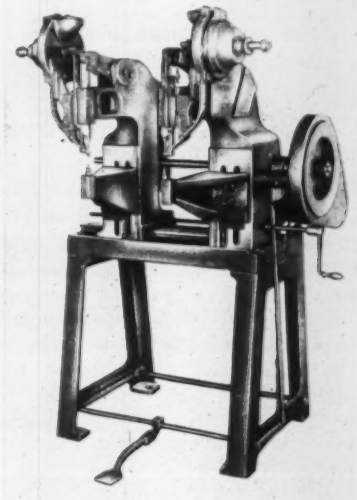
Standard 50 years of conveyor experience

GRAVITY & POWER CONVEYORS

NEW PRODUCTS and equipment

Riveting Machine

Model 109 automatically feeds and sets two rivets at the same time. The rivets may be of different styles and lengths. Diameters up to 0.200 in. can be handled.

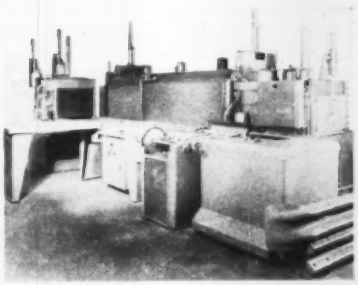


The machine has a 12-in. throat. A hand crank adjusts center distances from $\frac{5}{8}$ to 16 in. Minimum center distance can be reduced to $\frac{1}{4}$ in. by modifying the machine. *Write*: Tubular Rivet & Stud Co., Weston Avenue, Wollaston 70, Mass. (Metal Show Booth 1779)

Heat Treating

B Model P-6-3030 is a pusher tray furnace with an integrated oil quench and a self-purging charge vestibule. The furnace is serviced at each end by semiautomatic loading and unloading equipment.

The production unit does bright carburizing. The first zone has an initial heating capacity of 1000



9½ and 34-inch by 60-inch Foil Mill at Kaiser Aluminum and Chemical Corporation, Ravenswood, W.Va.

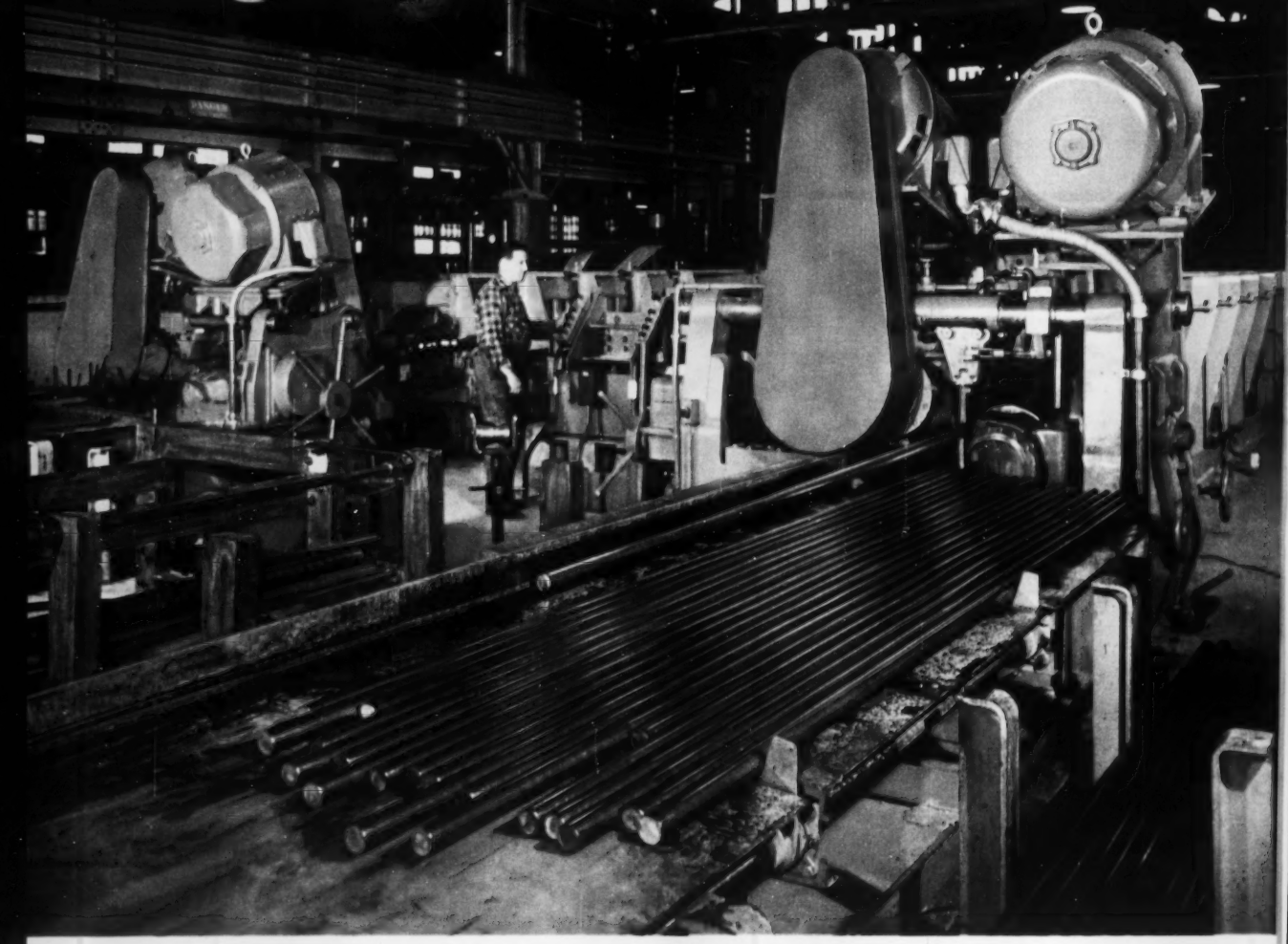
BLAW-KNOX
ALUMINUM FOIL MILLS

Blaw-Knox designs and builds a full range of Aluminum foil mills complete with auxiliary equipment to meet individual requirements. Other Blaw-Knox equipment for metals industry includes complete rolling mill installations including all auxiliary equipment for ferrous and non-ferrous metals, iron, alloy iron and steel rolls, Medart cold finishing equipment, carbon and alloy steel castings, fabricated steel plate or cast-weld design weldments, steel plant equipment, and heat and corrosion resisting alloy castings.

BLAW-KNOX

BLAW-KNOX COMPANY

Foundry and Mill Machinery Division
Blaw-Knox Building • 300 Sixth Avenue
Pittsburgh 22, Pennsylvania



BLAW-KNOX-Medart

provides high speed, precision finishing at American Steel and Wire Cold Drawing Plant

Two Blaw-Knox–Medart high speed, precision straighteners are handling the output of the new drawing line at the Cleveland Plant of the American Steel and Wire Division of U. S. Steel. The line operates at straightening speeds of up to 450 feet per minute on bars ranging in diameter from 1-inch to 4½ inches. The line is completely automated to the extent that bars are fed automatically from the shear to the stocking tables, into the feed troughs for the straighteners, through the straighteners and into the discharge storage cradles.

Either of these 2 and 2 Medart straighteners is capable of handling the entire output of one of the high speed draw benches. High throughput is achieved by means of a completely enclosed V-belt drive to each roll. Roll speeds are synchronized by means of electrical interlocks between the motors.

The Blaw-Knox–Medart Straighteners are standard equipment for straightening and polishing in a direct production line with a draw bench. They are available in sizes to handle bars and tubes in diameters of ⅛-inch to 10 inches. Contact your Blaw-Knox representative for information, assistance or service.

BLAW-KNOX

BLAW-KNOX COMPANY

Foundry and Mill Machinery Division
Blaw-Knox Building · 300 Sixth Avenue
Pittsburgh 22, Pennsylvania

lb of steel an hour. Two additional zones afford soaking interval control.

All zones are designed for 100 per cent forced circulation heating. *Write*: Ipsen Industries Inc., 715 S. Main St., Rockford, Ill. *Phone*: 5-9581 (Metal Show Booth 1606)

Multiple Drilling

Multi-Drill 400 is a close coupled, multiple spindle drilling attachment which can be furnished to fit any drill press.

The unit is available with 2, 3, or 4 spindles. Drill capacity in steel is ¼ in. *Write*: Commander Mfg. Co., 4233 W. Kinzie St., Chicago 24, Ill. *Phone*: Sacramento 2-4544 (Metal Show Booth 1035)

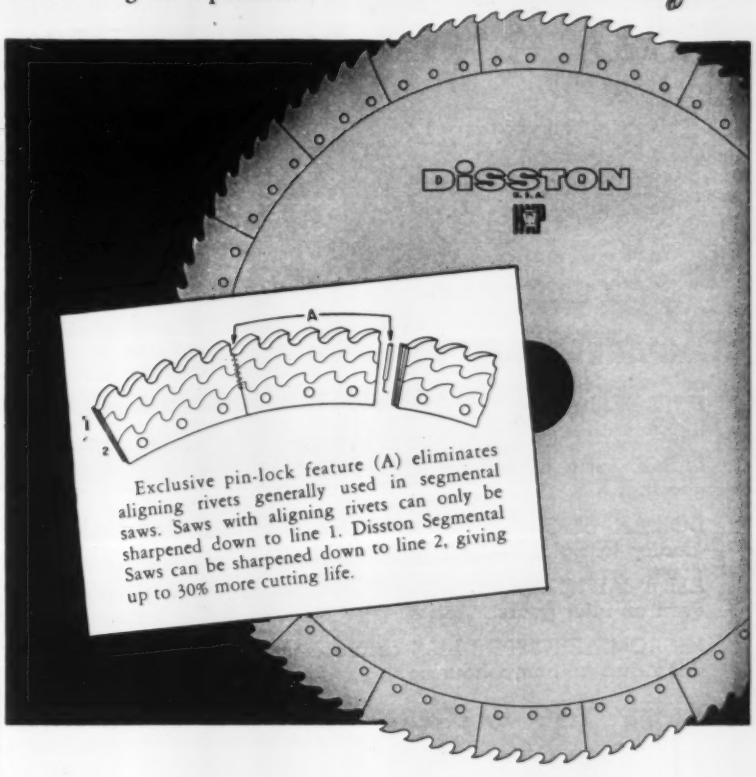
Spectrographic Analyzer

The Automatic Spectro-Lecteur is a direct reading instrument which permits the measurement of instantaneous values.

Two photomultipliers are used. One views the line of the base metal in the alloy. The other

Increase cutting life up to 30%...with
DISSTON SEGMENTAL CIRCULAR SAWS!

Exclusive pin-lock feature *locks* segments together by aligning pins—permanently holding the segments in perfect alignment. Since there are no aligning rivets to limit sharpening, up to 30% more cutting life is possible.


DISSTON
A
1
2
Exclusive pin-lock feature (A) eliminates aligning rivets generally used in segmental saws. Saws with aligning rivets can only be sharpened down to line 1. Disston Segmental Saws can be sharpened down to line 2, giving up to 30% more cutting life.

- **Replaceable high-speed steel segments need only infrequent sharpening.**
- **Narrow kerf assures fast, clean cutting with minimum waste.**
- **Teeth are accurately indexed so they may be sharpened on automatic machines.**
- **For cutting ferrous or non-ferrous metals.**
- **In diameters from 11″ to 63″.**

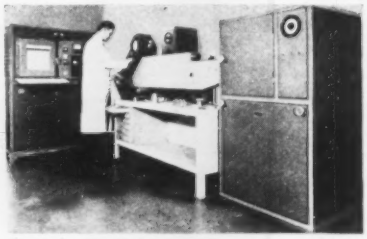
For cutting non-ferrous metals and plastics Disston also manufactures a complete line of solid tooth Diss-croloy and Alloy Circular Saws.

For new literature write to Henry Disston Div., H. K. Porter Company, Inc., Phila. 35, Pa.

H. K. PORTER COMPANY, INC.
Henry DISSTON DIVISION

travels automatically along the focal plane of the spectrum, stopping at selected lines according to a prearranged program. This gives a continuous measurement of instantaneous values of the intensity ratio between the recorded lines and the line of the base metal.

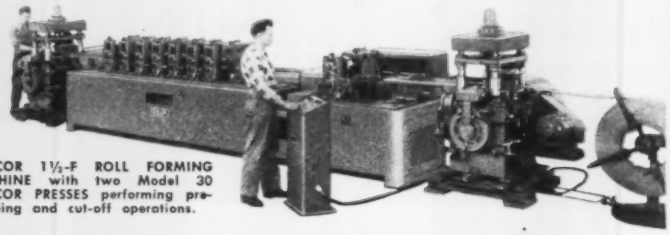
All metals are recorded according to their own period of stability. Analysis of a metal alloy including



six elements can be completed in 57 seconds.

Changeover from one alloy to another with the same base metal takes less than 1 minute. If the base metal is different, 5 minutes are required. *Write*: Intercontinental Electronics Corp., 1551 Franklin Ave., Mineola, N. Y. *Phone*: Pioneer 2-0600 (Metal Show Booth 110)

ARDCOR Roll Forming Mills



ARDCOR 1½-F ROLL FORMING MACHINE with two Model 30 ARDCOR PRESSES performing pre-notching and cut-off operations.

COMPARE These Exclusive Features . . . .

UNIT DESIGN—spindles in self-contained SEPARATE HOUSINGS, with speed reducers. Easily removed or replaced.

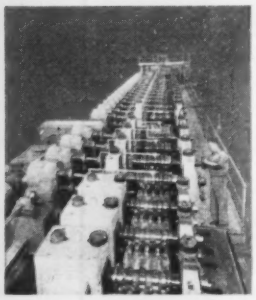
LARGE RANGE OF VERTICAL ADJUSTMENT through toggle gearing.

DOUBLE BEARING DESIGN OF DRIVE HOUSINGS adds greatly to rigidity—increases bearing and gear life.

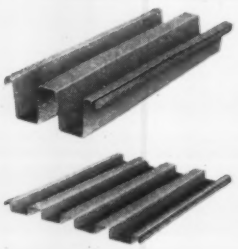
ALL BEARINGS ARE ANTI-FRICTION — no sleeve bearings, even on idler gears.

MICROMETER TYPE DIALS assure a positive setting both on drive and outboard housing.

ONE OF THE LARGEST MACHINES EVER BUILT ROLLS FLOORING, ROOF DECK . . .



Left: One of three mammoth ARDCOR Roll Forming Machines designed to form steel roof deck and flooring up to 132 ft. per minute. Entire production line 180 ft. long; approximate weight of equipment, 300 tons.



Consult our Engineering Facilities, without obligation . . .

ARDCOR Engineered MEANS BETTER COLD ROLL FORMING

American ROLLER DIE CORP.

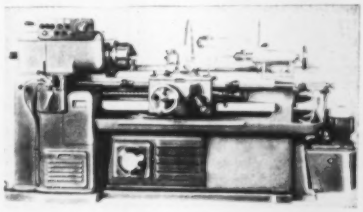
29520 Clayton Avenue Wickliffe, Ohio

DESIGNERS AND MANUFACTURERS: All Sizes and Spindle Diameters of Roll Forming Machines. Welded and Lock-Seam Tube Mills • Forming Rolls, Tubing and Pipe Rolls • Straightening, Pinch and Leveller Rolls • Cut-off Machines

Thread Cutting Lathe

This single point, thread cutting lathe has a 13 in. diameter swing. Thread cutting length is 32 in. The lead capacity is from 0.0250 in. to 2.00 in.

A 2-in. hole runs through the headstock. An electromagnetic clutch and brake provide instantaneous starting and stopping.



Cutting speeds of 400 lineal inches per minute are provided. *Write*: Man-Au-Cycle Corp. of America, 132 53rd St., Brooklyn, N. Y. *Phone*: Hyacinth 2-6561 (Metal Show Booth 1550)

Radial Drill

This ram-type machine can drill holes up to 18 in. deep. A compound angle attachment makes it possible to drill holes on any compound angle by rotating the drill head in two planes.

The machine has a drilling area

of 14.8 sq ft and handles workpieces over 4 ft high and over 4 ft in diameter.

The drill head provides spindle speeds from 78 to 1200 rpm. Speeds can be selected while the machine is rotating. Drills up to 1¾ in. in diameter can be used.

The machine can be converted instantly to a semiautomatic tapping machine. *Write*: I. O. Johansson Co., 7248 St. Louis Ave., Skokie, Ill. *Phone*: Orchard 3-9234 (Metal Show Booth 928)

Brazing Machine

Lighter parts are brought to temperature in 15 seconds by four Duradiant gas-fired burners. Production rate of this unit reaches 1800 an hour. It is automatic.

The machine does silver brazing and similar joining operations. *Write*: Selas Corp. of America, Dresher, Pa. *Phone*: Mitchell 6-6600 (Metal Show Booth 718)

Chemical Milling

This process can remove metal where tools can't reach—on extrusions, forgings, and preformed sheets.

Aluminum, magnesium, steel, and titanium can be milled chemically. *Write*: U. S. Chemical Milling Corp., 1700 Rosecrans, Manhattan Beach, Calif. *Phone*: Oregon 8-4041 (Metal Show Booth 425)

Paper Wipers

Lint-free paper wipers can be used for industrial operations and for keeping face and hands clean.

They eliminate the chance of work being marred by chips which become embedded in used wipers. *Write*: Scott Wipers, Industrial Packaged Products Div., Scott Paper Co., Chester, Pa. *Phone*: Chester 4-4211 (Metal Show Booth 1890)

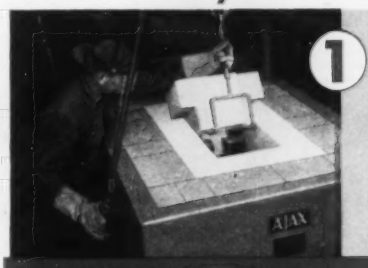
Wire Straightener

The 2CV Convertible series of wire straightening and cutting machines uses a dual-center straightening arbor which makes it possible to precision straighten small diameters.

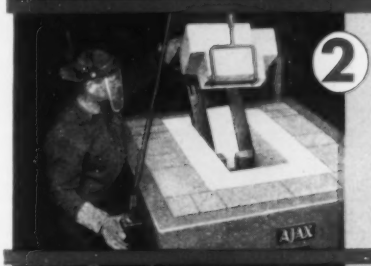
A variable speed drive provides feeds up to 200 fpm. The machines come equipped with an arbor for handling round wire. They can be converted quickly to handle shapes.

CHANGING AJAX SUBMERGED ELECTRODES IS

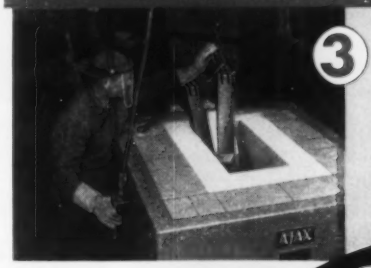
easy as 1-2-3!



1 **A closely-fitted tile block on top of the furnace seals the new Ajax REMOVABLE submerged electrodes from air. Lifting the tile exposes electrodes for fast, easy replacement, even by unskilled labor.**



2 **Note that electrodes enter furnace from the top and slant into the bath. There are no openings below the salt line. With the tile now lifted, the electrodes are freely accessible for fast replacement.**



3 **Lift electrodes out from the top! Change them in an hour or less per pair! No lost production time. Replacements can often be made while salt remains molten. Pot life is vastly increased because pot is not torn down in replacing electrodes.**

✻ **See it at the National Metal Show—Chicago Nov. 4-8, 1957 BOOTH 1406**

Write for Bulletin 810

AJAX HULTGREN electric SALT BATH furnaces

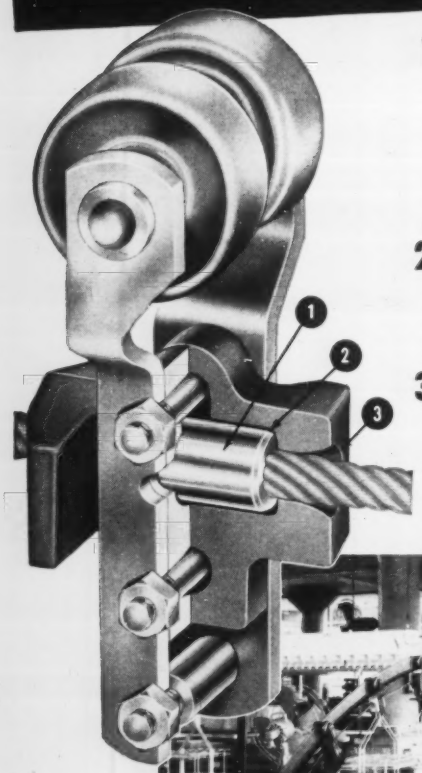
AJAX ELECTRIC COMPANY

952 Frankford Avenue Philadelphia 23, Pa.

Associates: Ajax Engineering Corp., Ajax Electrothermic Corp.

Pioneering Salt Bath Progress

NOW BUSH-LOCK design The No. 1 Choice in Overhead Cable Conveyors



1. ***BUSH-LOCK, the heart of this truly "Universal" Cable Conveyor***

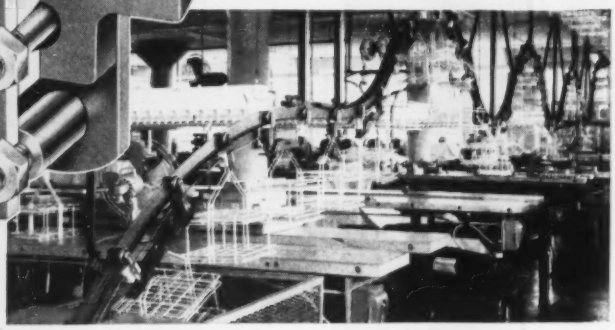
Cylindrical bushing permanently locked to preformed cable on accurate immovable centers by high-pressure swaging.

2. ***Rotary Floating Action***

Trolley castings bolted around BUSH-LOCK assure true alignment of trolley to track.

3. ***Bell shaped for longer cable life***

Castings allow cable to flex in all directions with smooth arc support.



A typical Buschman Cable Conveyor . . . carries light to medium weight loads through all operations at convenient heights.

Bush-Lock Cable in 100′ lengths provides a continuous power element with practically no points of wear. Stock track, drives, idlers and vertical curves are easily installed into a durable, efficient, low cost system.

Why not get all the facts how to produce more at less cost with compact, smoothly-operating Buschman conveyors.

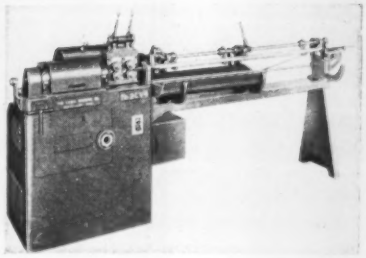
Write for literature today.

PRODUCE MORE . . . FOR LESS
Buschman CONVEYORS

C-333-EWB

THE E. W. BUSCHMAN COMPANY
4496 Clifton Avenue, Cincinnati 32, Ohio

NEW PRODUCTS and equipment



hexagonals, or flats by installing an interchangeable roll straightener. *Write*: Lewis Machine Co., 3441 E. 76th St., Cleveland 27, Ohio. *Phone*: Michigan 1-3015 (Metal Show Booth 1418)

Furnace

Model Y furnace is used to harden all types of high speed and high carbon, high chrome steels.

Tools can be soaked to assure maximum hardness without formation of scale or decarburization. A

neutral atmosphere is produced automatically. *Write*: Sentry Co., Foxboro, Mass. *Phone*: Kingswood 3-5330 (Metal Show Booth 150)

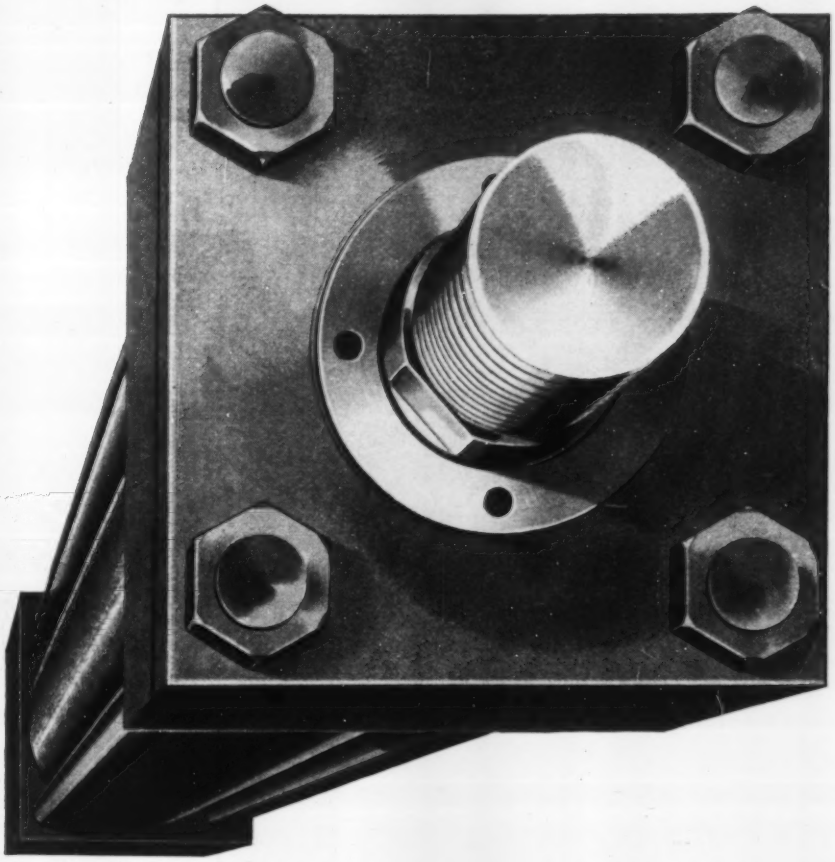
Annealing Furnace

Model F1212-2A is a double pumped, muffle type furnace with a hot zone 6 in. ID and 12 in. long. It can operate continuously at 2150° F or intermittently at 2200° F at a pressure of 1 x 10^{-4} mm of mercury or less.

The vacuum retort and cooling chamber are insulated and water cooled. Installation of a high vacuum, water cooled gate valve between the furnace and the cooling chamber makes semicontinuous operation possible.

The unit can be converted to a melting furnace by removing the

AT YOUR REQUEST...



ANKER-HOLTH

Hydraulic Cylinders now available in Square Head design

Positive Trouble-free Performance

Anker-Holth Division, for 18 years designers and manufacturers of quality air and hydraulic power cylinders, now offers a standard line of all steel, high pressure square head tie rod cylinders. Important new operating features and design achievements assure positive controlled power for a wide range of industrial applications.

Standardized Mountings for Interchangeability

Conservatively rated at 2000 P. S. I. working pressure and 3000 P. S. I. non-shock pressure every cylinder is proof tested at 4500 P. S. I. All mountings are available, standard bores from 1½ to 8 inches. Standardized mountings provide complete interchangeability with most makes of square head cylinders. The Anker-Holth "□" line meets all J. I. C. specifications.

For more information contact your local Anker-Holth representative or Anker-Holth Division, Port Huron, Michigan. YUkon 5-7181

ANKER-HOLTH DIVISION
THE WELLMAN ENGINEERING COMPANY
2729 CONNOR STREET, PORT HURON, MICH., U. S. A.

NUCLEAR PRODUCTS DIVISION

METALS & CONTROLS CORPORATION

USES THIS MULTI-RANGE

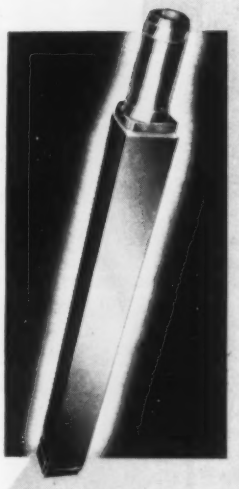
HEVI-DUTY BOX FURNACE

- To heat parts for rolling and bonding
- For critical aluminum brazing of nuclear fuel elements

"The versatility of our Hevi-Duty Electric Furnace enables us to perform many heat treating operations . . . from special heats for rolling and bonding of aluminum, uranium alloy or zirconium to the very critical operation of aluminum brazing of nuclear fuel elements."

Mr. Paul Moffat, manager of manufacturing engineering at the Nuclear Products Division of Metals & Controls Corporation, added that they are exceptionally pleased with the long heating element life under severe operating conditions and the wide variety of uses at temperatures to 1850°F.

Write for Bulletin 341 to see how you can put this versatile box furnace to work for you.



Nuclear fuel element brazed in Hevi-Duty Box Furnace.

HEVI-DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively

Dry Type Transformers *Constant Current Regulators*

NEW PRODUCTS and equipment

horizontal assembly and substituting a spherical melting chamber with a resistance heated furnace containing a crucible for melting 12 lb (steel) up to 3600° F. *Write*: High Vacuum Equipment Corp., 2 Churchill Rd., Hingham, Mass. *Phone*: Hingham 6-2430 (Metal Show Booth 1377)

Furnace Electrodes

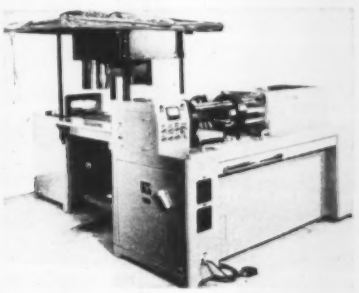
Submerged electrodes that can be removed from and replaced in salt bath furnaces at temperatures of 1350° F are made of noncritical alloys.

There is no lost production time during replacement. Spare casings are not needed, and it is not necessary to tear down and rebuild the tile pot. *Write*: Ajax Electric Co., Frankford Avenue at Delaware Avenue, Philadelphia 23, Pa. *Phone*: Nebraska 4-0548 (Metal Show Booth 1406)

Magnetic Inspection

Magnaflux - Magnaglo ARV-304 is a production unit that handles a wide variety of small steel and iron parts.

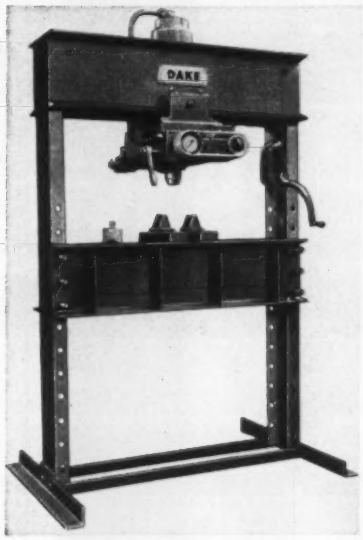
Magnetization may be both circular and longitudinal, simultaneous



or separate, to detect both longitudinal and transverse defects. *Write*: Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill. *Phone*: Underhill 7-8000 (Metal Show Booth 1153)

Hydraulic Presses

This line of air operated machines comes in models with capacities of 25, 50, 75, and 150 tons. Bending, straightening, and other press work is done by these machines.



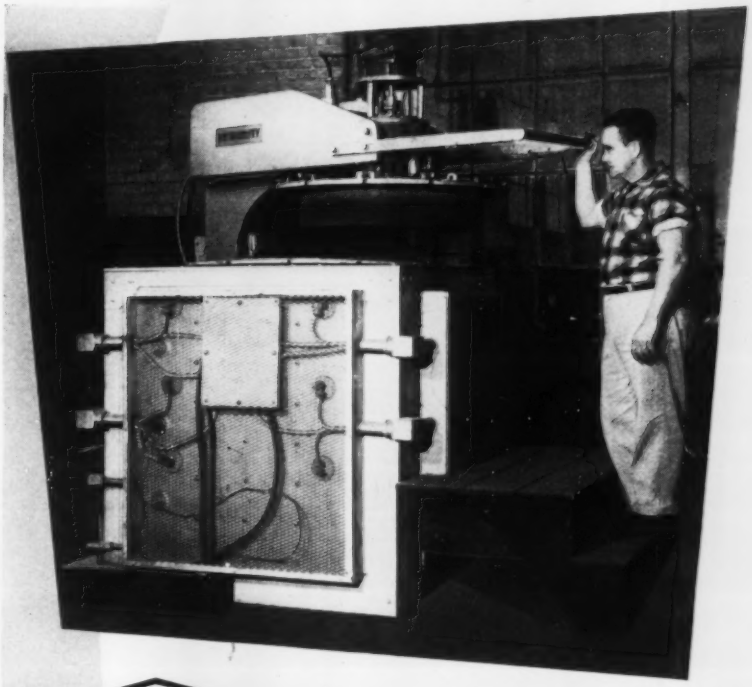
When the control knob is turned, the ram advances at high speed until it comes in contact with the work. It then automatically changes to the power stroke. The knob automatically turns to off position when the hand is removed.

The ram has a 10-in. stroke. *Write*: Dake Corp., Grand Haven, Mich. (Metal Show Booth 960)

Attenuation Comparator

This instrument is used in many laboratory investigations of materials, including hydrogen embrittlement in metals, internal oxidation, nuclear radiation damage, magnetic properties, plastic deformation, and dislocation damping.

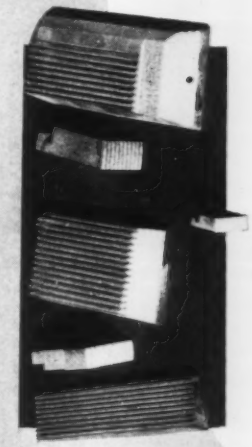
A linear circuit presents multiple and comparable echo patterns on an oscilloscope viewing screen. These multiple echos are compared



LANDIS MACHINE COMPANY USES THIS HEVI-DUTY

VERSA-DUTY PIT FURNACE

- For uniform temperature throughout the densest of loads and
- Ease of duplicating results from load to load.



High Speed Steel Chasers Tempered in Versa-Duty Pit Furnace.

"We have noted a marked improvement in the quality of our products because of greater uniformity in heat treatment . . . not only throughout each load . . . but from load to load." In addition, Mr. Leckie-Ewing, the chief metallurgist at Landis Machine Company, Waynesboro, Pennsylvania, says that because the tempering cycle is so easy to control, they can temper to within ±1 point Rockwell C.

If your products require nitriding, bright or steam tempering, annealing, bright or special bluing or non-atmosphere heat treating requiring temperatures to 1350°F, you can achieve outstanding results with Hevi-Duty's new Versa-Duty Pit Furnace.

Write for Bulletin 755 to find out how you can increase production, reduce rejects, save time, labor and floor space and eliminate many secondary operations.

HEVI-DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively

Dry Type Transformers *Constant Current Regulators*

NEW PRODUCTS and equipment

with a calibrated exponential decay curve which permits direct reading in decibels per microsecond. *Write*: Sperry Products Inc., Danbury, Conn. *Phone*: Pioneer 8-3581 (Metal Show Booth 1053)

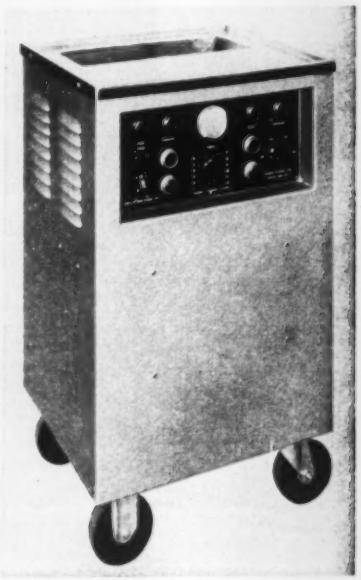
Stud Welding Gun

Studs up through ½ in. in diameter can be welded by the NS-10. The gun, made with durable red plastic, weighs less than 4 lb and is only 9 in. long. *Write*: Nelson Stud Welding Div., Gregory Industries Inc., Lorain, Ohio. *Phone*: Cherry 5-6931 (Metal Show Booth 1476)

Ultrasonic Cleaner

Model R-50 is a self-contained cleaner with a working volume of 5 gal. It can handle alkaline solutions, solvents, and mild acids.

Transducers mounted to the bottom of the unit have a rated input of 250 radio frequency watts average (1 kw peak), which they convert into mechanical vibrations at 38 kilocycles.



This high speed agitation causes cavitation in the liquid, providing a gentle, thorough scrubbing action. *Write*: Branson Ultrasonic Corp., 40 Brown House Rd., Stamford, Conn. *Phone*: Davis 4-6721 (Metal Show Booth 1854)

Blast Cleaning

The Rotoblast table room is used for cleaning castings, forgings, and stampings.

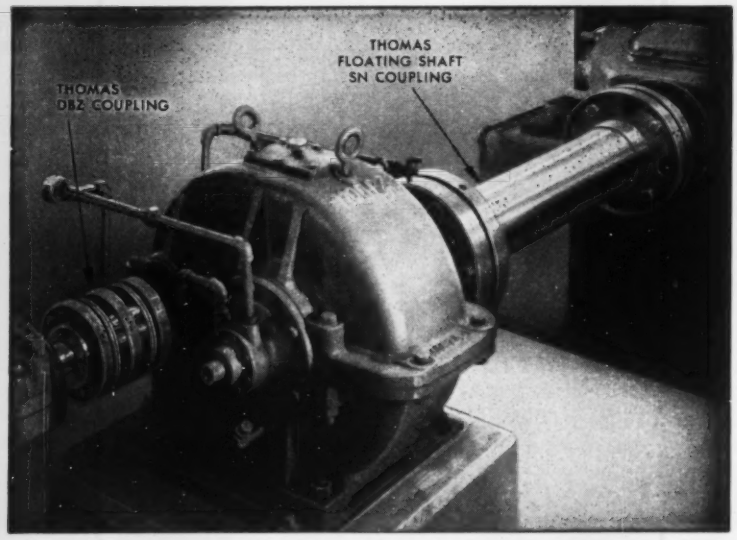
It can handle a 4000-lb load up to 48 in. in diameter and 24 in. high.

A cast, labyrinth sealing system makes the cabinet abrasive-tight without the use of rubber gaskets.

The standard table is equipped with a wheel (powered by a 10-hp motor) which will throw 15,000 lb of abrasive an hour. A 15-hp motor is available which will throw

THOMAS FLEXIBLE COUPLINGS

Give You Freedom From Coupling Maintenance



NO LUBRICATION **NO MAINTENANCE** **NO WEARING PARTS**

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.

They will protect your equipment and extend the life of your machines.

Properly installed and operated within rated conditions, Thomas Couplings should last a lifetime.

Under Load and Misalignment only Thomas Flexible Couplings offer all these advantages:

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY
WARREN, PENNSYLVANIA, U.S.A.

Another **STANLEY STEEL STRAPPLICATION*** on the job

Power easily makes 3 times 16 equal ONE

3 tiers of cylinder head forgings, 16 forgings to a tier, make a sum total of 48. But secured to a pallet by the Stanley "Uni-Tie" Method, all 48 become ONE compact package, easier for this Cleveland manufacturer to handle, store and ship. Using the Stanley Electric Skid Magazine Power Tool, every strap is effortlessly and speedily *power*-tightened to the same pre-determined tension, so there's no danger of the strapping loosening or the load shifting.

Perhaps teaming up the Stanley "Uni-Tie" Method with *power packaging* is the way for *you* to save time, space, man-power or eliminate costly containers. **WRITE FOR FREE COPIES** of the new "Power Strapplications" booklet and the "Stanley Strapplication Manual of Packaging and Shipping" to **STANLEY STEEL STRAPPING**, Division of The Stanley Works, Dept. J, 1476 Lake Street, New Britain, Conn.

**The system-atic way to solve specific packaging and shipping problems*

INSURE IT-SECURE IT-WITH STANLEY STEEL STRAPPING

AMERICA BUILDS BETTER AND LIVES BETTER WITH STANLEY

STANLEY

This famous trademark distinguishes over 20,000 quality products of The Stanley Works—hand and electric tools • drapery, industrial and builders hardware • door controls • aluminum windows • stampings • springs • coatings • strip steel • steel strapping—made in 24 plants in the United States, Canada, England and Germany.

Aluminum swamp buggies skim over wet grass even faster than over water!

Sail over swamps at highway speeds!

Made of light, tough aluminum, these broad, flat-bottomed boats are used daily—by rangers, engineers, sportsmen—to penetrate "impenetrable swamps."

Aluminum's ability to do things better than they were ever done before has made it the world's fastest growing metal.

Fortunately—in neighboring Canada there is abundant water power to produce the enormous amounts of electricity needed to smelt aluminum. There, Aluminium Limited, an independent Canadian company, has developed two of the world's great hydroelectric systems in British Columbia and on the Saguenay and Peribonka Rivers in Quebec to power its vast aluminum smelters.

A substantial proportion of this aluminum from Canada will be shipped to the United States in the form of ingot.

For Aluminium Limited sells no end products in the U. S. It concentrates, instead, on supplying hundreds of U. S. fabricators with the metal that's increasingly important to U. S. business . . . vital to U. S. defense.

Aluminium Limited, Montreal: *Canada's independent producer of aluminum ingot for U. S. industries.*

Aluminum from Canada

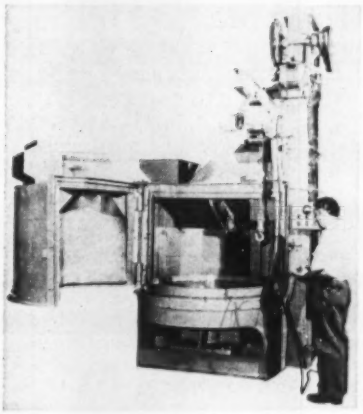
The aluminum story that's told 4,018,882 times

Over four million copies of *Time*, *Newsweek* and *U.S. News and World Report* carry this story of aluminum's amazing versatility. Regular nation-wide advertisements like this are helping to make the United States still more aluminum-conscious . . . helping you to build greater sales of your aluminum products.

Aluminium Limited *Sales, Inc.*

630 Fifth Avenue, New York 20, N.Y., Cleveland, Chicago, Los Angeles, Detroit, Atlanta, Buenos Aires, São Paulo

NEW PRODUCTS and equipment



22,000 lb of abrasive an hour. *Write*: Pangborn Corp., Hagerstown, Md. *Phone*: Hagerstown 3500 (Metal Show Booth 1263)

Cleaning Compounds

This nonfoaming, alkaline detergent removes identification inks from aluminum.

Other products: A barrel burnishing compound; a powdered acid scale and rust remover; a solvent acid stripper that removes tough epoxy resins at room temperature; and a zinc phosphating compound for low temperature applications. *Write*: Oakite Products Inc., 134E Rector St., New York 6, N. Y. *Phone*: Whitehall 3-0940 (Metal Show Booth 247)

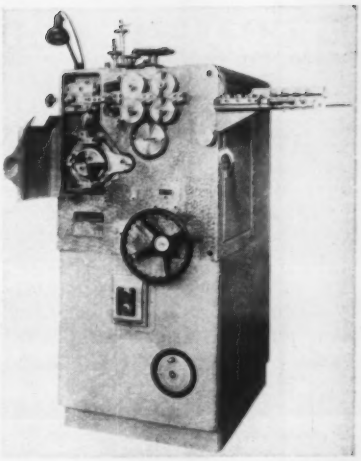
Vacuum Melting Furnace

This induction heated furnace has a crucible capacity of up to 100 lb. It is suited for pilot plant use and the production of small castings. *Write*: F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa. *Phone*: Cumberland 9-0100 (Metal Show Booth 631)

Springmaker

The W-11A Springmaker is easy to set up. Location of controls and simplified design help to combine accuracy and high production.

The torsion attachment is located in a pocket in the front housing.



The clutch is inside the machine. *Write*: Torrington Mfg. Co., Torrington, Conn. (Metal Show Booth 1567)

Overhead Conveyor

Chainveyor is a conveying system that combines vertical up and down curves with horizontal curves.

A combination of power and free

line operation can be used in overhead conveyors. This system uses an automatic cam-action carrier which holds flat materials such as light gage metal sheets. Single loads up to 30 lb can be carried without any danger of marring their surfaces. *Write*: Chainveyor Corp., 5618 E. Washington Blvd., Los Angeles 22, Calif. *Phone*: Raymond 3-4741 (Metal Show Booth 1826)

Hardening Machine

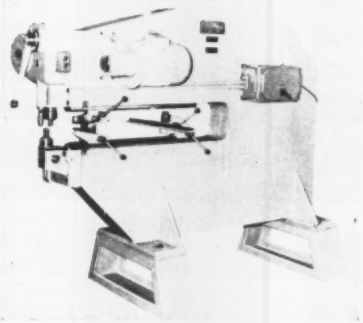
"Building block" type of construction goes into the Flamatic hardening machine.

An electronic temperature control automatically ends the heating cycle and causes the workpiece to be dropped into a quench tank when its surface temperature reaches a preset value. *Write*: Process Machinery Div., Cincinnati Milling Machine Co., Cincinnati 9, Ohio. *Phone*: Redwood 1-2121 (Metal Show Booth 1798)

Machine Works Sheet

Model P-9 does straight, irregular, circle, inside, and slot cutting as well as beading, joggling, edge banding, flanging, dishing, nibbing, and louvering.

Mild steel $\frac{3}{8}$ in. thick can be formed.



The machine has a stationary lower tool and a reciprocating upper tool. *Write*: American Pullmax Co. Inc., 2455 N. Sheffield Ave., Chicago 14, Ill. *Phone*: Diversey 8-5727 (Metal Show Booth 1065)

Hardness Tester

Model YR is a motorized Rockwell hardness tester. The semiautomatic unit has a short test cycle, permitting more readings within a definite time period.

A special dial gage makes it unnecessary to set the dial bezel for each test. *Write*: Wilson Mechanical Instrument Div., American Chain & Cable Co. Inc., 230 Park Ave., New York 17, N. Y. *Phone*: Murray Hill 6-8800 (Metal Show Booth 953)

Vacuum Furnace

Type 2721 is a consumable arc, cold mold furnace which produces ingots weighing up to 100 lb (in steel). It is a package unit which facilitates installation.

The furnace is used as a production unit for rare metals and as a research unit for steel. *Write*: NRC Equipment Corp., 160 Charlemont St., Newton Highlands 61, Mass. *Phone*: Decatur 2-5800 (Metal Show Booth 1426)

NEW literature

Write directly to the company for a copy

Low Lift Truck

Electric walkie trucks with lifting capacities of 4000 and 6000 lb are described in this 4-page bulletin, 1008-W. Automatic Transportation Co., division of Yale & Towne Mfg. Co., 149 W. 87th St., Chicago 20, Ill.

Dielectric Core Ovens

Bulletin 657, 8 pages, describes a line of ovens using radio frequency power to cure synthetic resin bonded cores quickly. A chart presents engineering data and dimensions of 14 models with rated output capacities of 30 to 200 kw. Dept. 3D, Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

Coupling Tapping

A machine for the automatic tapping of internal threads of oil tubular couplings (range: 1¼ in. external upset tubing to 6 in. casing) is described in Bulletin E-98, 12 pages. Landis Machine Co., Waynesboro, Pa.

Live Centers

Specifications of standard Morse taper and three types of special live centers are given in this 4-page bulletin. Sturdimatic Tool Co., F Street, Detroit, Mich.

Cutting Tool Research

This 32-page data book is a practical presentation of the use of modern tool materials in production metal turning. Information on ceramics and carbide materials and techniques is included. Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

Carbon Steel Tubing

Advantages of electric resistance welded mechanical tubing are given in Bulletin TB-419, 8 pages. Tubular Products Div., Babcock & Wilcox Co., Beaver Falls, Pa.

Spring Washers

This 6-page bulletin lists more than 1000 sizes of washer dies used for forming ferrous and nonferrous metals. Included are blanking and punching dies for making flat, cupped, curved, wavy, slotted, and belleville spring washers from 0.125 to 4.735 in. OD. Associated Spring Corp., Bristol, Conn.

Machine Tools

Turret lathes and their accessories, automatic lathes, automation units, boring machines, thread and form grinders, and optical comparators are described in this 22-page bulletin, 5713. Advertising Dept., Jones & Lamson Machine Co., Springfield, Vt.

Ductile Iron Valves

This 6-page bulletin describes the advantages of ductile iron and gives specifications on the metal and the valves. Kennedy Valve Mfg. Co., 572 E. Water St., Elmira, N. Y.

Thermocouples

This chart shows color codes and calibration symbols for thermocouples and extension wires. Pyrometer wire resistance figures are listed on the other side. Thermo Electric Co. Inc., Saddle Brook, N. J.

Pinch Jaw Chucks

Automatic chucks for the precision machining of jet engine discs and rings are covered in this 4-page bulletin. Cushman Chuck Co., Hartford 2, Conn.

Grooving Machines

Bulletin 76D, 4 pages, describes hand and power-operated grooving

(Hint: It concerns a new, high-flying complete line of electric motors.)

NEW LITERATURE . . .

machines for making single and Pittsburgh lock seams. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo 11, N. Y.

Ball Bearings

This 36-page catalog describes a full range of bearings for use in precision instruments. Topics discussed include starting torque limits, thrust loads, tolerances, fits, lubrication, and top speeds. New Departure Div., General Motors Corp., Bristol, Conn.

Mill Products and Alloys

Extrusions, forgings, and other wrought mill products of aluminum, titanium, and other metals are featured in this 12-page bulletin. Harvey Aluminum Sales Inc., 19200 S. Western Ave., Torrance, Calif.

Stainless Steel

This case history bulletin, P. O. 2157, 20 pages, tells how fabricators improve product design and performance with 17-4 PH and 17-7 PH stainless steel bar and wire. Product Information Service, Armco Steel Corp., Middletown, Ohio.

Titanium Wire and Rod

Tables convert wire diameter sizes (0.002 to 0.200 in.) to linear feet per pound, and round and square bar stock (1/16 to 3/4 in.) to pounds per linear foot. Johnston & Funk Titanium Corp., W. Kemrow Avenue, Wooster, Ohio.

Welding

The 1958 edition of the Welding Data Book (TIS 2575A) describes simplified welding procedures for every base metal. The 180-page book covers 120 welding rods, electrodes, and welding compounds. Weld preparation steps are given for all metals. Best torch adjustments and electrode position and manipulation are described. Technical Information Service, Eutectic Welding Alloys Corp., Flushing 58, N. Y.

Tubes for High Temperatures

Bulletin TDC-153B, 4 pages, presents stress rupture data on carbon steel, several alloy steels, and ten stainless steels at 850 to 1800° F. Tubular Products Div., Babcock & Wilcox Co., Beaver Falls, Pa.

Electric Brake

This 36-page design manual, WEB 6293, describes an electric brake for fail-safe applications. Included is an explanation of its operation, selection factors, torque characteristics, and controls. Warner Brake & Clutch Co., Beloit, Wis.

Cutoff Machines

This 4-page bulletin describes machines for cutting off tubing, pipe, and bar stock. Also covered are automatic loaders and hot spinning machines. Modern Machine Tool Co., 2005 Losey St., Jackson, Mich.

Toolroom Grinding

This 28-page bulletin covers the grinding of alloy, high speed, and die steels. Discussions cover wheel shapes, wheel symbols and marking, tool sharpening, and grinding. Mounted wheels are pictured and grading recommendations are included. Carborundum Co., Box 477, Niagara Falls, N. Y.

Castings

Advantages of investment, permanent mold, and centrifugal castings (ferrous and nonferrous) are com-

Top Secret from Tipp City, Ohio

...and we're releasing it next month

Your A. O. Smith Motor Man will be around soon with details. In the meantime, see the announcements coming up in any of the following magazines — STEEL (November 25), PRODUCT ENGINEERING (November 11), ELECTRICAL MANUFACTURING (November), PURCHASING (November).

Through research . . . *a better way*

A.O.Smith CORPORATION

ELECTRIC MOTORS

TIPP CITY, OHIO

International Division: Milwaukee 1, Wisconsin

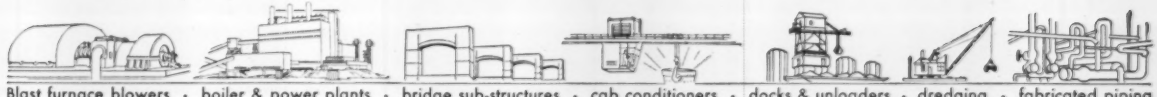
DRAVO-LURGI sinter plants convert iron ore fines to usable form

Two new sinter plants, with a combined annual capacity of over 10,000,000 tons, are being built by Dravo. Each plant will contain three huge sinter machines for processing iron ore fines into clinkers suitable for charging blast furnaces.

Through an exclusive licensing agreement with the Lurgi Company, Europe's foremost builder of sinter machines, Dravo Corporation's extensive engineering and construction facilities are combined with Lurgi's design experience. The new plants now under construction are a result of this combination.

Dravo's engineering and construction skills play an important part in making new processes and techniques available to industry. For information on any of the products or services listed below, write DRAVO CORPORATION, PITTSBURGH 22, PENNSYLVANIA.

DRAVO
CORPORATION

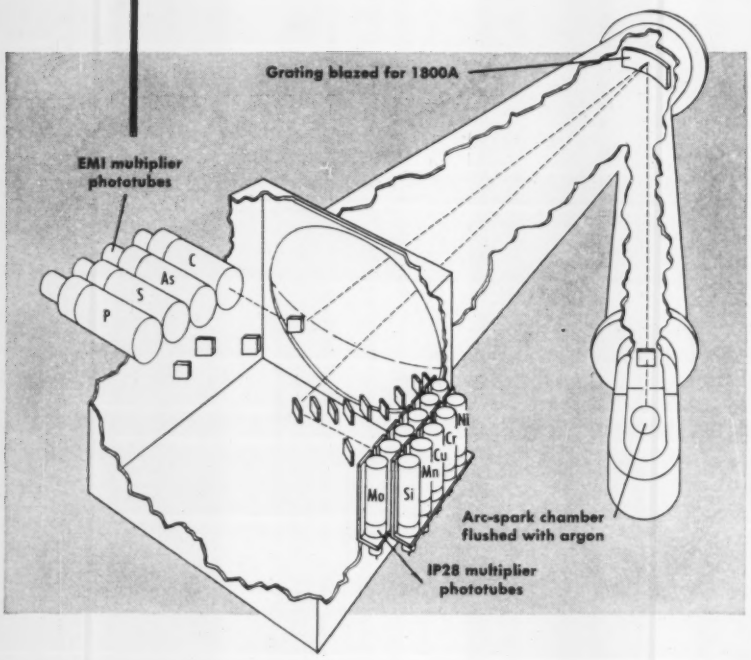


Blast furnace blowers • boiler & power plants • bridge sub-structures • cab conditioners • docks & unloaders • dredging • fabricated piping

foundations • gantry & floating cranes • gas & oil pumping stations • locks and dams • ore & coal bridges • process equipment • pumphouses & intakes

river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

New Quantovac adds C, S, & P to metallic elements for complete high-speed analysis of steel & cast irons



ARL introduces the first large vacuum spectrometer to extend range of direct-reading spectrochemical analysis into far ultraviolet

The iron and steel industry has an important new high-speed analytical tool. For the first time, carbon, sulfur and phosphorus can be analyzed simultaneously with all the metallic elements in a few minutes. These nonmetallic elements no longer require expensive, separate analysis. Now, this one high-speed, direct-reading instrument will do the complete job.

By means of an evacuated spectrometer and argon-flushed arc-spark chamber, the Quantovac extends the spectrum range into the far ultraviolet. It thus provides the most sensitive arc lines of C, S, P, As, and Se for spectrochemical analyses, besides the usual lines of the metallic elements. In fact, as many as 24 elements may be analyzed simultaneously in the 1600-3300A range with the Quantovac.

The Quantovac will provide high-speed furnace control. It will save time and labor. Please write for full information. Your inquiry will be answered fully and promptly.

*TRADE MARK

See the Quantovac at the Metal Exposition, Chicago
Nov. 4-8 • Booth 1239

Applied Research Laboratories
SPECTROCHEMICAL EQUIPMENT
3717 PARK PLACE • GLENDALE 8, CALIFORNIA
NEW YORK • PITTSBURGH • DETROIT • CHICAGO • DALLAS • LOS ANGELES • LAUSANNE, Switzerland • LONDON, England

NEW LITERATURE . . .

pared in this 4-page bulletin. B-Mold Div., Buckeye Brass & Mfg. Co., 203-213 Central Ave., Mansfield, Ohio.

Regulator Valves

Bulletin J-SC, 4 pages, shows how to size sliding gate valves. Data tell how to adjust sizing for variations in pressure, temperature, viscosity, and specific gravity. Jordan Corp., 6013 Wiehe Rd., Cincinnati 13, Ohio.

Steam Heating Coils

Double - tube steam distributing coils and required selection data are covered in Bulletin B-1418, 8 pages. American Blower Div., American Radiator & Standard Sanitary Corp., Detroit 32, Mich.

X-Ray Spectograph

This 8-page bulletin describes the operation and use of an automatic indexing unit that prints out intensity ratios on 1 to 24 elements of a single sample in a short time. Instruments Div., Philips Electronics Inc., 750 S. Fulton Ave., Mt. Vernon, N. Y.

Collets

Catalog 57, 24 pages, lists dimensions and prices on a line of standard collets, pushers, pads, and accessories. Sheffer Collet Co., Traverse City, Mich.

Speed Reducers

Double reduction units with ratios from 75:1 to 4900:1 are described in a 20-page bulletin, CD-230. Cone-Drive Gears Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

NEW BOOKS

Industrial pH Handbook, Thomas J. Kehoe, Process Instruments Div., Beckman Instruments Inc., 2500 Fullerton Rd., Fullerton, Calif. 80 pages, $2.

This book reviews industrial pH control systems, their principles, and application engineering and equipment. Use of buffer solutions and pH values are covered.

Handbook of Powered Industrial Trucks, Industrial Truck Association, 900 F St. N. W., Washington 4, D. C. 92 pages, $5.

Sections in this book include industrial truck applications, cost savings through industrial truck handling, planning for and selection of industrial trucks, and engineering data.

Tough job — tough control — tough wire — this Arens control is designed for controlling valves on hydraulic dump trucks.

KEYSTONE GALVANIZED MB SPRING WIRE STUDY

Uniform wire is the secret at ARENS CONTROLS, INC.

EVANSTON, ILLINOIS

ARENS CONTROLS INC.

Arens manufactures a wide selection of quality controls used on many applications ranging from jet bombers to lawn mowers. Because of their range of sizes and types, they have streamlined their control production assembly to the point that a completed control can come off the line every few seconds. Naturally, failure anywhere along the line means costly slow-up of production. That's why they specify Keystone Galvanized MB Spring Wire for their most critical operation—manufacture of the control casing.

Keystone Galvanized MB Spring Wire has consistent uniformity of composition, temper and diameter. It is manufactured by Keystone's unique method of cold drawing after galvanizing to produce a dense, smooth zinc coating free from flaking.

Keystone Wire can help you, too, assure yourself of steady production. We invite you to talk it over with your Keystone representative or call us . . . today!

Keystone Steel & Wire Company
Peoria 7, Illinois

KEYSTONE

WIRE FOR INDUSTRY

STEEL MEN!

WHAT IS THE COST OF A "CORHART BALANCED TANK"?

•

BECAUSE Corhart Electrocast sells for several times more than ordinary clay blocks, some operators have gotten the impression that a Corhart tank costs three or four times more than an all-clay furnace.

Nothing, however, could be further from the truth. By *balancing* his furnace with the proper amount of Electrocast, the average Corhart customer adds so little to the installation cost that the difference is repaid by a *fractional part of the extra production gained.*

If you have never obtained an estimate for a Corhart Balanced Tank, (a tank with all vulnerable spots fortified by Electrocast), we believe you will be more than surprised at the low cost for which this ideal type of installation can be made . . . . Send us the plans of your furnace, with a brief description of its past history. Using the experience gained in designing 65 Corhart Balanced Tanks, we will gladly recommend the amount and location of Electrocast needed to *balance* your furnace, and submit for your consideration complete blue-prints and quotations . . . . This service will cost you nothing, but it will probably prove the most interesting reading of the year. No obligation—and no high-pressure "follow-up." *Address:* Corhart Refractories Co., Incorporated, 16th and Lee Streets, Louisville, Kentucky.

QUALITY ECONOMY ENDURANCE

CORHART ELECTROCAST REFRACTORIES

WE RAN this ad for a Corhart Electrocast Refractory a little over 25 years ago—back when only a handful of glass manufacturers would think of using this new product, "one of the world's highest-priced refractories". Yet today virtually every furnace in the glass industry uses Corhart Electrocast . . .

Today Corhart 104 is new in the steel industry. And although it too is "one of the world's highest-priced refractories", it offers open-hearth furnace operators the same opportunties for greater production and lower costs that Corhart Electrocast brought to the glass industry.

Would you like to have complete data? Address: Corhart Refractories Co., *Incorporated,* 1632 West Lee Street, Louisville 10, Kentucky, U.S.A., SPring 8-4471.

QUALITY ECONOMY ENDURANCE

CORHART 104 ELECTROCAST REFRACTORY

The words "Corhart" and "Electrocast" are registered Trade Marks which indicate manufacture by Corhart Refractories Company, *Incorporated.* Corhart Refractories Co., *Incorporated.* 1600 West Lee Street, Louisville 10, Kentucky, U.S.A.—Telephone SPring 8-4471.

STEEL
October 28, 1957

Market Outlook

ALTHOUGH steel demand this fall is not as brisk as had been anticipated, indications are consumption is outrunning new orders. Sluggishness is mainly traceable to inventory reductions prompted by freer supply conditions. Volume is expected to at least hold at current demand levels the next couple months.

STOCKS SHRINKING— There is some reason to believe consumers' inventories are being rapidly depleted. New buying, in many cases, is thought to closely approximate current manufacturing requirements. It could mean that many buyers are running the risk of being caught with short supplies.

WARNS OF TROUBLE— A midwestern sheetmaker warns that hand-to-mouth buying could get consumers into trouble quicker than they realize. He says while 15 to 30 day deliveries are available, a slight increase in ordering could extend shipments tremendously. In some instances they could go to six months overnight.

DISAPPOINTING— Automotive demand has been disappointing. And it doesn't look like auto needs will improve much over the next month or so. The situation is adversely affecting buying from other consuming directions, inducing general caution, and freeing supplies that ordinarily would have been taken up.

EXPLANATION— Sluggish automotive business, in part, results from the fact this is the first year in a long time in which the car builders have had access to unlimited steel supplies on a prompt delivery basis. They are able to hold inventories down, ordering to fit needs.

PRODUCTS EASIER— Heavy plate and wide flange structural supplies fall short of demand. But the situation is improving steadily. Both may be fully competitive by yearend. Despite the acceleration of auto assemblies, there is no pinch in cold-rolled sheets; hot-rolled sheets and carbon bars are readily available.

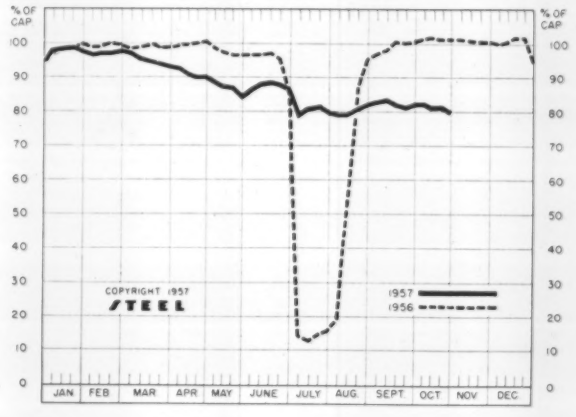
HEAVY GOODS OFF— Some heavy items have eased in recent months. The railroads have not laid rails as extensively this year as originally planned, and freight car programs have tapered with carloadings. Delays in road building reduced bridge and pavement needs and have cut purchases of earthmoving equipment.

PRODUCTION SLIPPING— Steelmaking operations declined 1.5 points last week to 79.5 per cent of national ingot capacity. The rate is equivalent to about 2,035,000 net tons, or 460,000 less than the figure in the like period a year ago. Whether operations are close to bottom is questionable in view of current sluggish demand and general economic uncertainty.

EXPECTED PICKUP— Steel executives expected a sharp rise in post-Labor Day operations. At the Senate price hearing last week, President A. B. Homer of Bethlehem Steel said his company had anticipated close to capacity operations in the fourth quarter. So far it is operating at 91 per cent, with little rise in sight.

SCRAP DECLINING— Pronounced weakness in the scrap market continues. STEEL's composite on No. 1 heavy melting steel has declined for ten consecutive weeks. It dropped another $1 a ton last week to $36.83, a new low since June, 1955. Other price composites are unchanged, with finished steel at $146.03.

NATIONAL STEELWORKS OPERATIONS



DISTRICT INGOT RATES

(Percentage of Capacity Engaged)

	Week Ended Oct. 27	Change	Same Week 1956	Same Week 1955
Pittsburgh	80.5	+ 0.5*	100.5	104
Chicago	83.5	— 0.5*	102.5	98.5
Mid-Atlantic	81	— 1.5	101	98
Youngstown	65	— 2	102	100
Wheeling	72.5	— 3.5	103.5	100
Cleveland	94.5	+ 6*	107.5	103.5
Buffalo	95	— 2.5	107.5	105
Birmingham	71.5	— 2	95.5	94
New England	50	— 2	85	90
Cincinnati	89	+ 3	100.5	90
St. Louis	94.5	0	94.5	97
Detroit	96	— 3.5*	100	100.5
Western	92	0	105	91
National Rate	79.5	— 1.5	101.5	98

INGOT PRODUCTION‡

	Week Ended Oct. 27	Week Ago	Month Ago	Year Ago
INDEX (1947-1949=100)	127.3†	128.9	131.0	155.1
NET TONS (In thousands)	2,045†	2,070	2,105	2,491

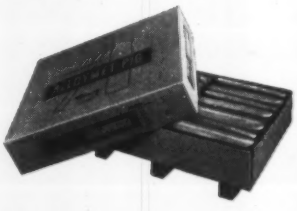
*Change from preceding week's revised rate. †Estimated. ‡Amer. Iron & Steel Institute. Weekly capacity (net tons): 2,559,490 in 1957; 2,461,893 in 1956; 2,413,278 in 1955.

Metalworking Outlook—Page 113 Metal Show Section—Page 161

HOW MUCH NICKEL IN A CHARGING BOX FULL OF SCRAP?

Even the best guess is never a sure thing. Never as sure as using Alloymet Nickel Alloy Pig. Comes to you in freight-saving all-fiberboard carton with its own pallets — weight and certified analysis right on the side. The whole carton of 26 pigs — about 1300 pounds — goes right into the furnace as is.

Check with us. See how using Alloymet Pig works out in your steelmaking operation.



ALLOY METAL PRODUCTS, Inc.
PHONE 6-2561 • TELETYPE DV 588
(FORMERLY A DIVISION OF **ALTER COMPANY**)
ROCKINGHAM ROAD
DAVENPORT, IOWA

World's largest producer of secondary nickel alloys of certified analysis

Van Huffel Tube Corp.

Market for Shapes Grows

No contour is too complicated to be made by one of the cold-forming methods. While these shapes still find great use as trim, most applications today are functional

"THE PRODUCT with a thousand shapes" could well be the slogan for producers of cold-rolled shapes, and it might be an understatement at that.

As one sales executive puts it: "We have not found the shape too complicated to make. The only limitation is the size of our equipment."

Evolution—This industry is over 50 years old, but its greatest advances have been made in the last ten years or so. The product is made to order for the myriad of decorative shapes found on everything from automobiles to office machines. But in recent years its functional value has surpassed its decorative use.

The high strength-to-weight ratio of tubular shapes is utilized in many structural applications. One producer of welded tubular shapes says: "For a given cross-sectional area, a tube has many advantages over a solid bar. It is lighter, has good strength and in many cases requires less finishing."

Individual Attention—This is a specialized industry because of the great variety of designs required by its customers. While many of the shapes are standard, literally thousands must be engineered from the ground up. Most producers make their own dies to customer specifications and retain possession of them after the initial run is over. So they have complete control over the product from beginning to end.

Unless the customer gives his written permission, the dies are not used by any other customer. However, the producer does have a stock of hundreds of standard forms for general customer use.

One maker of roller die formed shapes estimates he has 1000 to 1500 separate sets of dies. Another estimates he has over 2000. A producer of welded tubular shapes can make 350 to 400 distinct shapes. And new ones are being designed continually.

From Beds to Plows—The markets for this product have been growing steadily. Harold van Huffel, secretary of Van Huffel Tube Corp., Warren, Ohio, says that in its early days, one of his company's biggest customers was the bed manufacturing industry. "We used to ship tubular bedsteads out of here by the carload. That market is practically gone now, but we serve makers of other metal furniture, transportation equipment, communications equipment, farm implements, appliances, the construction industry, and many others."

One thing that has helped in the development of markets, according to L. C. Colleran, sales manager of Roll Formed Products Co., Youngstown, is the adaptation of secondary operations to the product. It is possible to prenotch, punch, bend, coil, emboss, and otherwise fabricate the shape before the customer takes delivery. This saves him time, money, and equipment.

Range of Metals — The main prerequisite for any material to be formed is ductility. Although commercial quality low carbon steel is the most common metal used, high carbon steel, high strength

steel, stainless steel, aluminum and its alloys, bronze, brass, and copper can be shaped. Both galvanized pipe and sheets can be shaped without marring the surface. And roller die forming is practical on prepainted sheet.

Methods of Production—The two best known methods of forming tubes or shapes are roller die forming and cold drawing through turk's-head dies. In roller forming you start with coiled sheet or strip, and run it through a series of dies which gradually form it into the desired shape (see illustration, Page 259). Depending on the complexity of the shape, anywhere from 2 to 20 stands may be required.

The average production rate is about 100 fpm, so output of 30,000 to 40,000 ft a day is not uncommon. An economical minimum for the production of any one section is about 3500 ft, says one producer. So, the process is not suitable for parts to be made in small quantities. Such items may be more economically formed on a press brake, he adds.

In forming with a turk's-head, a welded tube is fed through the dies designed to produce the desired shape. It is common to use only two or three sets of dies. However, producers point out that several sets must be used in the initial forming of the tube, so that the total number of stands involved is probably equal to that required in roller forming.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 268 & 269

Sheet and strip suppliers depending on the automotive industry for the bulk of their sales are disappointed by the lack of large volume orders.

Everybody has been looking for auto business to lead the sheet market out of its slump. But it hasn't developed, and the feeling is now spreading through the trade that auto tonnage in November will be no better than that in October.

All grades of sheets and strip are available for early delivery. Demand from appliance manufacturers and other consumers shows no signs of increasing.

The American Steel & Wire Div., U. S. Steel Corp., is producing embossed strip with delicate patterns at its Cuyahoga Works, Cleveland. Promising markets include decorative office furniture and equipment, tableware, home appliances, and hardware.

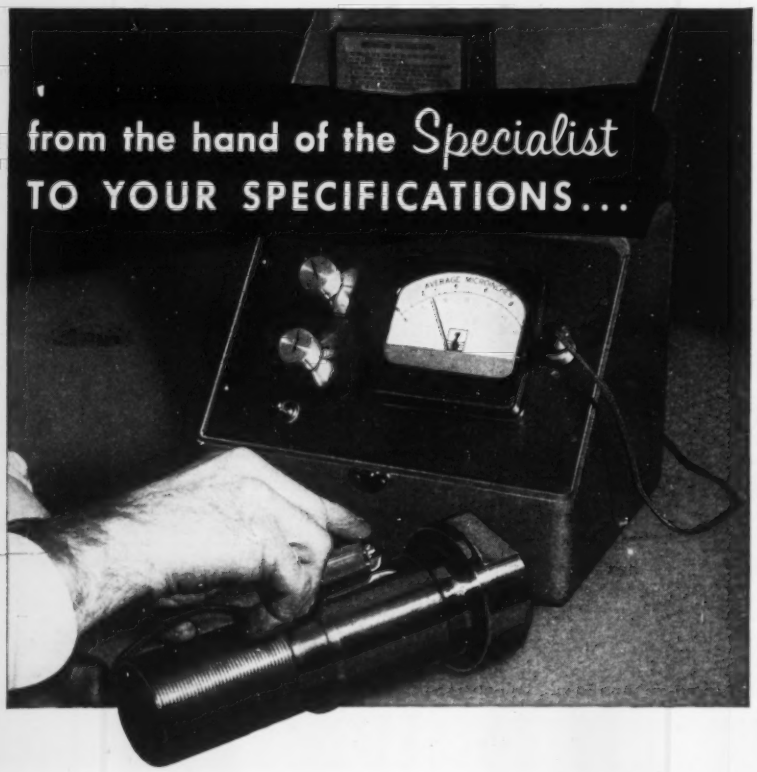
Steel Bars . . .

Bar Prices, Page 267

October sales of hot-rolled bars about equal September's volume. Orders from auto builders for November delivery are moderately improved, but only small tonnages are involved, and these are being offset by a slowing down in demand from miscellaneous consumers.

Cold-drawn bar sales continue in the doldrums. There are no signs of a buying pickup in fourth quarter.

Carbon and alloy bar buying continues slow in New England. One of the largest users in the area, a builder of heavy electrical equipment, reflects current procurement policy of most consum-



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The reading on this Surfindicator measures more than just the fine finish on this special bolt. It measures the result of the precision craftsmanship your own specifications receive at Erie Bolt & Nut Company. Producing a wide variety of special fasteners to resist corrosion, extremes in temperature and tensile stresses as specified is our exclusive job . . . has been for almost half a century.

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ERIE BOLT & NUT CO.
Erie, Pennsylvania
Representatives In Principal Cities

ers: Availability and shipments over the next three months will be no problem; forward buying is pointless.

Iron Ore . . .

Iron Ore Prices, Page 274

Shipments of Lake Superior iron ore in the week ended Oct. 21 totaled 2,365,817 tons, reports the American Iron Ore Association. This compares with 2,850,104 tons shipped in the like week a year ago.

Cumulative shipments to Oct. 21 this year were 77,004,737 tons, compared with 63,459,000 tons to the same date last year.

Imports of iron ore in the first seven months this year totaled 17,523,849 gross tons valued at $149,660,349, reports the U. S. Bureau of Mines. Tonnage receipts were as follows:

Source	Tonnage	Value
Brazil	841,891	$11,831,297
British W. Africa	132,146	984,028
Canada	5,946,476	53,031,942
Chile	1,290,133	9,483,825
Cuba	28,538	292,136
Dominican Republic	109,395	1,483,316
Liberia	592,336	5,709,737
Mexico	129,529	390,697
Peru	1,408,586	12,317,516
Sweden	414,478	5,847,970
United Kingdom	339	19,094
Venezuela	6,629,973	48,266,711
West Germany	29	2,080
Totals	17,523,849	$149,660,349

First shipments of Venezuelan iron ore to be received by U. S. Steel Corp.'s Youngstown District plant have been received (65 carloads from Philadelphia). Over 150,000 tons will be stockpiled at the plant over the next ten weeks.

Sells Zirconium Sponge

Commercial grade zirconium sponge is available from Columbia-National Corp., Cambridge, Mass. The company (jointly owned by Columbia-Southern Chemical Corp. and National Research Corp.) recently made its first shipment from its plant in Santa Rosa County, Fla. The sale was to a leading producer of special alloy products.

Blast Furnace Output Up

Blast furnace production totaled 6,627,911 net tons in September, reports the American Iron & Steel Institute. Of the total, 6,569,074 tons were pig iron, 58,837 tons were ferromanganese and spiegeleisen. In September a year ago, output was: 6,873,064 tons of pig iron, 59,584 tons of ferroalloys.

Output in the first nine months this year totaled 61,760,634 gross tons (61,178,395 pig iron, 582,239 ferroalloys). This compares with 54,264,932 tons (53,794,955 pig iron, 469,977 ferroalloys), produced in the like period of last year. Comparative data are given in the following table:

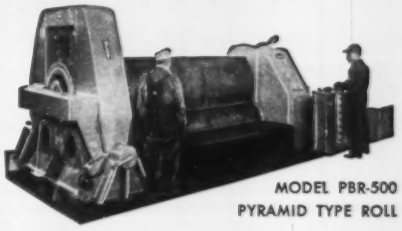
BLAST FURNACE PRODUCTION BY DISTRICTS
(9 Months; Net tons)

Districts	Pig Iron 1957	Pig Iron 1956	Ferromanganese & Spiegel 1957	Ferromanganese & Spiegel 1956
Eastern	13,008,014	11,138,178	263,778	229,243
Pittsburgh-Youngstown	20,598,048	18,825,194	203,963	146,535
Cleveland-Detroit	7,427,283	6,458,234	.....	.....
Chicago	12,422,127	10,972,270	.....	.....
Southern	4,705,212	3,561,003	114,498	94,199
Western	3,017,711	2,840,076	.....	.....
Totals	61,178,395	53,794,955	582,239	469,977

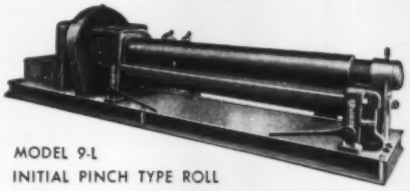
WEBB PLATE FABRICATING MACHINERY

PLATE BENDING ROLLS

The Webb Corporation offers a complete line of Plate Bending Rolls for the rolling of the thinnest plate up to plate 2½" thick. Offered in a variety of lengths and thicknesses. Constructed for the modern fabricating shop.



MODEL PBR-500
PYRAMID TYPE ROLL

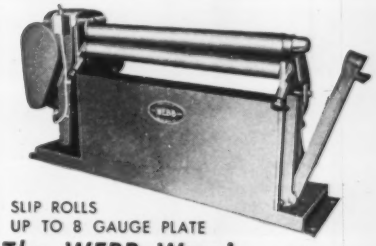


MODEL 9-L
INITIAL PINCH TYPE ROLL

Two types available: the Initial Pinch Type and Pyramid Type machines. All latest advantages of today's modern machine tools are incorporated, utilizing anti-friction bearings, totally enclosed gear drives. Special forming rolls for culvert pipe, stock tanks and other special shapes available.

SLIP ROLLS

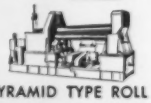
A complete line of small Sheet Metal Forming Rolls are also available. All power-driven with shaft sizes 3" to 5" for the handling of the thinnest gauge material, up to 8 gauge material. Special rolls for the forming of polished sheets, aluminum and stainless steels can be furnished. Complete catalogues on any size machine furnished upon request; write Dept. D.



SLIP ROLLS
UP TO 8 GAUGE PLATE

Let Speed PAY-The WEBB Way!

SLIP ROLLS



PYRAMID TYPE ROLL

INITIAL TYPE ROLL

STEELWORKERS

Also Manufacturers of INDUSTRIAL WEIGHING EQUIPMENT

Since 1881 THE WEBB CORP.
WEBB CITY, MO., U. S. A.

Tubular Goods . . .

Tubular Goods Prices, Page 271

Sales of most tubular products are declining, but producers of line pipe and oil country goods expect to sell their entire fourth quarter production. Standard pipe and mechanical tubing are moving slowly. Only a little more activity is reported in pressure tubing.

Sellers of oil country goods report that carbon steel tubing is readily available, but that a shortage of high-strength alloy tubing continues.

Smaller buyers of oil country goods are reducing inventories, but major users in the Southwest are expected to maintain stocks at about present levels.

Plates . . .

Plate Prices, Page 267

Stringency in sheared plate supply continues. Producers are behind on commitments. One eastern mill is considering blanking out a month's production to enable it to catch up on arrearages, though the over-all market situation is less pressing than it was some weeks ago.

Easing continues in universal, strip plates, and light sheared plates. Supply and demand are in closer balance.

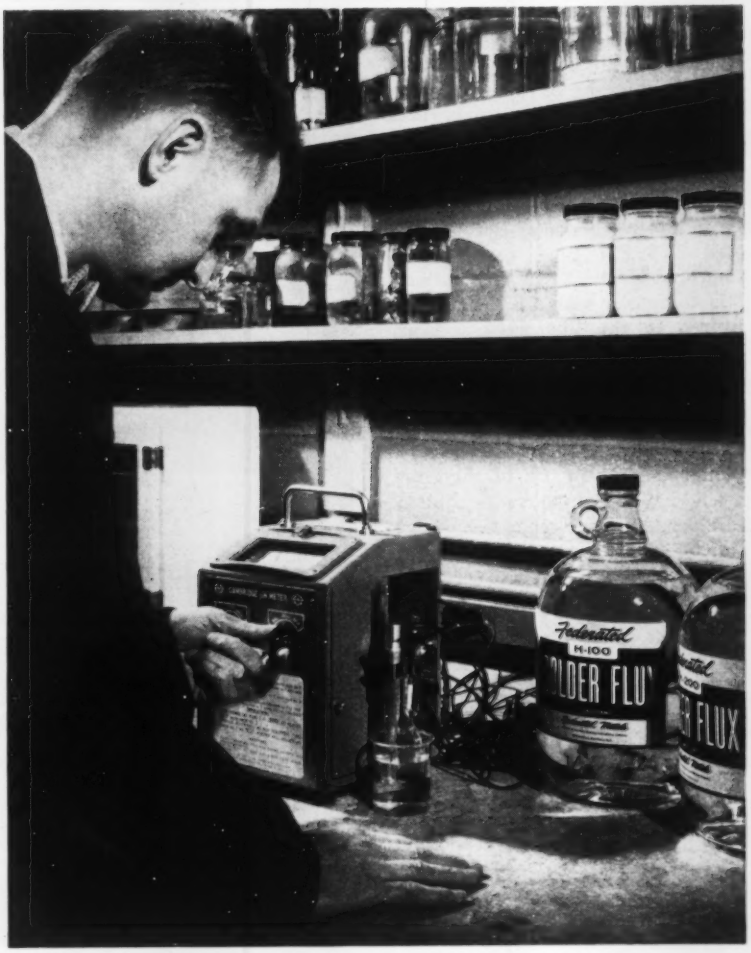
Major outlets include the oil and gas industry, shipbuilding, and construction, but activity in those groups is leveling out. There is also some easing in railroad equipment and industrial machinery requirements.

Warehouse . . .

Warehouse Prices, Page 272

The usual fall upswing in distributors' bookings has failed to materialize, although trading is fairly active at some points. Some orders being booked are for immediate use. (Spot delivery is specified.) The consensus is that improvement is likely to develop next month.

Stocks of plates and structural shapes are increasing. Bars and merchant pipe are moving slowly, while flat-rolled products are generally in fair demand. No significant gain is noted in sales to automotive suppliers.



FEDERATED COMPETITIVELY TESTED FLUXES

A-SERIES FLUXES

Acid base fluxes with superior cleaning ability, excellent solder spread.

H-SERIES FLUXES

Unique hydrazine-derivative fluxes for soldering copper to copper and copper to plated items. Excellent cleaning ability. Superior solder spread. Non-corrosive. Require no washing. Ideal for pre-dip work . . . you can pre-flux parts and store 'til ready for soldering.

R-SERIES FLUXES

Rosin base fluxes. Fine cleaning ability and solder spread. Non-corrosive.

Federated products:

Aluminum, Babbitts, Brass, Die Casting Metals, Fluxes, Lead and Lead Products, Magnesium, Plating Materials, Solders, Type Metals, Zinc Dust

COMPETITIVELY TESTED Federated Fluxes Save Trouble and Money

You can be sure that the Federated flux you buy has the best available combination of properties for the work it is to do. You can be sure that joints are chemically clean... that initial oxides are removed and further oxidation prevented during the soldering operation.

ASARCO's Central Research Laboratory checks production samples of Federated Fluxes against similar fluxes from competitive suppliers. Until laboratory tests prove that Federated products contain better properties, they are not approved for sale.

Federated Metals ASARCO

Division of

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While price schedules remain firm in the Seattle area, low quotations quoted by Portland interests on some items continue to harass Seattle distributors in the overlapping territory.

Wire . . .

Wire Prices, Pages 269 & 270

Manufacturers wire sales are improving slightly from low third quarter levels due to a gain on automotive account. Such products as bead wire, used in making tires, are in better demand.

Several other consuming lines have increased buying, having completed inventory reductions. Orders are being placed on short leadtime, and the market is highly competitive.

Merchant wire sales are declining seasonally.

Structural Shapes . . .

Structural Shape Prices, Page 267

Structural steel demand continues to slide. Industrial and commercial inquiry is off, and public work, including bridges, schools, and institutional construction, is lighter.

Fabricators' backlogs are declining, and some shops have openings in schedules which make for more competitive prices.

There continues to be a shortage of heavy wide flange shapes —16 in. and up for column sections, 24 in. and up for beams. One maker of large sections is behind 70 days on commitments, another 45 to 60 days.

Less wide flange tonnage is coming out for structural work being estimated in New England. The bulk of current demand is for bridges, with requirements falling below those in first half.

Pig Iron . . .

Pig Iron Prices, Page 272

The lag in merchant iron business continues. Expected fall buoyancy has not developed, and some sellers say the trend is downward. They are not optimistic over prospects for the remainder of the year.

Gray iron foundries have scant order backlogs for castings and are booking a shrinking volume of new business. They report that

buyers of castings in the building product and machinery fields have reduced their purchases.

Many blast furnace operators are stockpiling iron, and some plan to curtail operations during the winter.

Semifinished Steel . . .

Semifinished Prices, Page 267

Four open hearth furnaces have been taken out of production in the No. 2 shop at the Pittsburgh Works of Jones & Laughlin Steel Corp. Each furnace has a rated capacity of 220 tons per heat; the annual capacity of the four is 476,000 tons.

Republic Steel Corp. is putting two new electric furnaces and a strip mill into operation at Gadsden, Ala. Republic's eight open hearth furnaces in the area have ingot steel capacity of 789,000 tons annually. The new furnaces will add 408,000 tons.

The Gadsden expansion is part of Republic's company-wide program to increase its ingot capacity by 2 million tons, bringing its total to 12,240,000. The new Gadsden facilities will be dedicated formally Oct. 30.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

2000 tons, wood pulp mill, Bowaters-Carolinas Corp., Catawba, S. C., to B. L. Montague Co., Sumter, S. C.; Daniel Construction Co., Greenville, S. C., general contractor.

1900 tons, terminal building and west pier, Moisant International Airport, New Orleans, to Orleans Material & Equipment Co., New Orleans; J. A. Jones Construction Co., Shreveport, La., general contractor.

1160 tons, state bridge work, Lehigh County, Pennsylvania, through James D. Morrissey, general contractor, to Mayer Pollock, Pottstown, Pa.; award has been pending some time.

1140 tons, transit sheds and piers, Mobile, Ala., to Hartley Boiler Works, Montgomery, Ala.; Blount Bros. Construction Co., Montgomery, general contractor.

730 tons, plant addition, Bendix Aviation Corp., Mishawaka, Ind., to Fort Wayne Structural Steel Co., Ft. Wayne, Ind. (direct); Sollitt Construction Co., South Bend, Ind., general contractor; 75 tons of reinforcing steel, Nelson Engineering Sales Inc.

705 tons, state highway bridge, Richmond, Va., to Richmond Steel Co. Inc., Richmond; W. E. Graham & Sons, Cleveland, N. C., general contractor.

350 tons, science building, Clemson College, Clemson, S. C., to Kline Iron & Steel Co., Columbia, S. C.; Boyle Construction Co., Sumter, S. C., general contractor; 85 tons of reinforcing steel, Southern Engineering Co., Charlotte, N. C.

300 tons, state bridge work, Lehigh County, Pennsylvania, to Lehigh Structural Steel Co., Allentown, Pa.

200 tons, Sunset Junior High School, Seattle, to Leckenby Structural Steel Co., Seattle.

150 tons, chemistry building, University of Colorado, Boulder, Colo., to United Steel & Iron Works, Denver; Mead & Mount, Denver, general contractor.

STRUCTURAL STEEL PENDING

1875 tons, Washington State, Hood Canal floating bridge; Morrison Knudsen Co., Puget Sound Bridge & Dredging Co., General Construction Co., Seattle, and Henry J. Kaiser Co., Oakland, Calif., low joint bid at $14,226,690.

936 tons, state bridge work, Manahawkin Bay, Ocean County, New Jersey, bids Nov. 7.

935 tons, three trestle structures, Manahawkin Bay, Stafford-Ship Bottom, Ocean County, New Jersey; bids Nov. 7, Trenton, N. J.

500 tons or more, remodeling four Washington State ferries; Pacific Car & Foundry Co., Seattle, low at $1,211,252.

REINFORCING BARS . . .

REINFORCING BARS PLACED

1200 tons, wood pulp mill, Bowaters-Carolinas Corp., Catawba, S. C., to Joseph Fox Co., Birmingham; Daniel Construction Co., Greenville, S. C., is general contractor.

785 tons, chemistry and animal science building, University of Georgia, Athens, Ga., to Hall Steel Co., Atlanta; H. W. Ivey Construction Co., Atlanta, general contractor.

510 tons, terminal building and west pier, Moisant International Airport, New Orleans, to Mississippi Steel Corp., New Orleans; J. A. Jones Construction Co., Shreveport, La., general contractor.

375 tons, transit sheds and piers, Mobile, Ala., to Conners Steel Div., H. K. Porter Company Inc., Birmingham; Blount Bros. Construction Co., Montgomery, Ala., general contractor.

325 tons, reinforcing and structurals, high school, Madison, N. J., to Igoe Bros. Inc., Newark, N. J. (bars), and Schmidt Iron Works, Passaic, N. J. (structurals); Thomas Construction Co. Inc., Paterson, N. J., general contractor.

315 tons, chemistry building, University of Colorado, Boulder, Colo., to Colorado Builders Supply Co., Denver; Mead & Mount, Denver, general contractor.

260 tons, high school, Herkimer, N. Y., to Whitlaine Construction Specialties Inc., Binghamton, N. Y.; Vincent J. Smith Inc., Binghamton, general contractor; 70 tons of structural steel to Bethlehem Contracting Co., Bethlehem, Pa.

230 tons, three-span plate girder bridge, Merrimack River, Concord, N. H., to the Bancroft & Martin Rolling Mills Co., South Portland, Maine; Monroe-Langstroth Inc., Norwood, Mass., general contractor; 515 tons of bearing piles, Bethlehem Steel Co., Bethlehem, Pa.; 1355 tons of fabricated structural steel to American Bridge Div., U. S. Steel Corp., Pittsburgh.

195 tons, state highway bridge, Richmond, Va., to Virginia Steel Co., Richmond; W. E. Graham & Sons, Cleveland, N. C., general contractor.

REINFORCING BARS PENDING

6300 tons, Washington State Hood Canal floating bridge; bids in.

455 tons, also prestressed girders, 24 steel piles, etc., Seattle Ballard Bridge grade separation, bids Nov. 13.

450 tons, three trestle structures, Manahawkin Bay, Stafford-Ship Bottom, Ocean County, New Jersey; bids Nov. 7, Trenton, N. J.

PLATES . . .

PLATES PENDING

1500 tons, also 1000 tons of shapes, two Washington State ferries; Puget Sound Bridge & Dredging Co., Seattle, low at $4,288,000.

300 tons, including shapes, 18,000-bbl. coast tanker for Standard Oil Co. of California; general contract to Albina Engine & Machine Works, Portland, Oreg.

100 tons plus, 200,000-gal elevated steel water tank; bids to King County District No. 75, Seattle, Oct. 30.

Imported Steel delivered on Domestic Terms

No red tape! We deliver to any place in North America. Over 10 years of service to more than 2000 North American accounts—as a domestic firm, on domestic terms—with lower costs or better deliveries. Write for "How to be at home with products made abroad" and the address of your local Kurt Orban Company representative.

Prices per 100 lbs. (except where otherwise noted) landed, including customs duty, but no other taxes.

	Atlantic & Gulf Coast	West Coast	Vancouver	Montreal
Deformed Bars (⅝" Dia. incl. all extras)	$6.63	$6.86	$6.61	$6.29
Merchant Bars (¼" Round incl. all extras)...	7.62	7.85	7.48	7.22
Bands (1"x⅛"x20' incl. all extras)	7.76	7.98	7.65	7.38
Angles (2"x2"x¼" incl. all extras)	6.57	6.75	6.99	6.69
Beams & Channels (base)	6.82	7.00	7.24	6.94
Furring Channels (C.R. ¾", per 1000')	26.62	27.77	....	....
Barbed Wire (per 82 lb. net reel)	6.95	7.40	7.75	7.80
Nails (bright, common, 20d and heavier)	8.38	8.58	9.07	8.99
Larssen Sheet Piling (section II, new, incl. size extra)	7.80	8.10	8.10	7.80
Wire, Manufacturer's bright, low C, (11½ga.)	7.38	7.52	8.52	8.52
Wire, galv., Fence qual., low C (11½ ga.) ..	8.01	8.15	9.42	9.42
Wire, Merchant quality, bl. ann.. (10 ga.)....	7.60	7.75	8.78	8.78
Rope Wire (.045", 247,000 PSI, incl. extras)..	13.60	13.75	13.00	13.00
Wire, fine and weaving, low C, (20 ga.)	10.66	10.80	10.17	12.17
Tie Wire, autom. baler (14½ ASWG, 97 lbs. net)	9.58	9.73	9.64	9.54
Merchant Pipe (½" galv. T & C, per 100')...	8.48	8.83	....	....
Casing (5½", 15.5 J55, T & C, per 100').....	189.00	194.00	....	....
Tubing (2⅞", 6.4 J55, EUE, per 100').....	98.00	99.00	....	....
Forged R Turn. Bars, C-1035 (from 10" dl.).	13.50	13.73	13.50	13.24

Ask prices on: Bulb tees, bolts and nuts, manganese steel plates and shapes, welded wire reinforcing mesh and hardware cloth, boiler tubes, A-335-P11 pressure pipe.

from prominent century-old West German Mills

Through Stahlunion-Export GmbH

BOCHUMER VEREIN World's first Steel Foundry, 1842—Vacuum degassed Forgings. Pinion wire and spring wire for watches and clocks.

DORTMUNDER UNION Originators of Interlock Sheet Piling—Larssen Sheet Piling, Plate, Shapes, Forged Bars and Shafts.

NIEDERRHEIN Europe's most modern Rod Mill—OH, CH, Low Metalloid, Specialty Wire Rod, Merchant Bars.

WESTFAELISCHE UNION Europe's largest Wire Mill—All types drawn Wire and Wire Products—Nails, Barbwire, Wire Rope, Prestress Concrete Wire and Strand.

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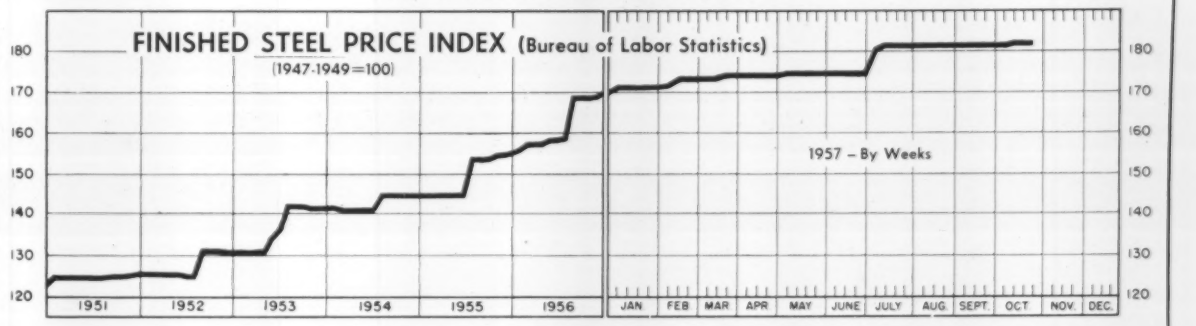
Price Indexes and Composites



Oct. 22, 1957	Week Ago	Month Ago	Oct. Avg.	Year Ago
181.7	181.7	181.5	181.7	168.6

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Oct. 22

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard No. 1	$5.600	Bars, Reinforcing	6.210
Rails, Light, 40 lb	7.067	Bars, C.F., Carbon	10.360
Tie Plates	6.600	Bars, C.F., Alloy	13.875
Axles, Railway	9.825	Bars, C.F., Stainless, 302 (lb)	0.553
Wheels, Freight Car, 33 in. (per wheel)	60.000	Sheets, H.R., Carbon	6.192
Plates, Carbon	6.150	Sheets, C.R., Carbon	7.089
Structural Shapes	5.942	Sheets, Galvanized	8.220
Bars, Tool Steel, Carbon (lb)	0.535	Sheets, C.R., Stainless, 302 (lb)	0.688
Bars, Tool Steel, Alloy, Oil Hardening Die (lb)	0.650	Sheets, Electrical	12.025
Bars, Tool Steel, H.R., Alloy, High Speed, W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.60 (lb)	1.355	Strip, C.R., Carbon	9.243
Bars, Tool Steel, H.R. Alloy, High Speed, W18, Cr 4, V 1 (lb)	1.850	Strip, C.R., Stainless, 430 (lb)	0.493
Bars, H.R., Alloy	10.525	Strip, H.R., Carbon	6.245
Bars, H.R., Stainless, 303 (lb)	0.525	Pipe, Black, Buttweld (100 ft)	19.814
Bars, H.R., Carbon	6.425	Pipe, Galv., Buttweld (100 ft)	23.264
		Pipe, Line (100 ft)	199.023
		Casing, Oil Well, Carbon (100 ft	194.499
		Casing, Oil Well, Alloy (100 ft)	304.610
Tubes, Boiler (100 ft)	49.130	Black Plate, Canmaking Quality (95 lb base box)	7.583
Tubing, Mechanical, Carbon (100 ft)	24.953	Wire, Drawn, Carbon	10.225
Tubing, Mechanical, Stainless, 304 (100 ft)	205.608	Wire, Drawn, Stainless, 430 (lb)	0.653
Tin Plate, Hot-dipped, 1.25 lb (95 lb base box)	9.783	Bale Ties (bundles)	7.967
Tin Plate, Electrolytic, 0.25 lb (95 lb base box)	8.483	Nails, Wire, 8d Common	9.828
		Wire, Barbed (80-rod spool)	8.719
		Woven Wire Fence (20-rod roll)	21.737

STEEL's FINISHED STEEL PRICE INDEX*

	Oct. 23 1957	Week Ago	Month Ago	Year Ago	5 Yr Ago
Index (1935-39 avg=100)	239.15	239.15	239.15	225.58	181.31
Index in cents per lb	6.479	6.479	6.479	6.111	4.912

STEEL's ARITHMETICAL PRICE COMPOSITES*

	Oct. 23 1957	Week Ago	Month Ago	Year Ago	5 Yr Ago
Finished Steel, NT	$146.03	$146.03	$146.19	$137.48	$110.98
No. 2 Fdry Pig Iron, GT	66.49	66.49	66.49	62.63	55.04
Basic Pig Iron, GT	65.99	65.99	65.99	62.18	54.64
Malleable Pig Iron, GT	67.27	67.27	67.27	63.41	55.77
Steelmaking Scrap, GT	36.83	37.83	46.33	57.00	43.00

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130.

Comparison of Prices

Comparative prices by districts, in cents per pound except as otherwise noted. Delivered prices based on nearest production point

FINISHED STEEL	Oct. 23 1957	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bars, H.R., Pittsburgh	5.425	5.425	5.425	5.075	3.95
Bars, H.R., Chicago	5.425	5.425	5.425	5.075	3.95
Bars, H.R., deld., Philadelphia	5.725	5.725	5.725	4.93	4.502
Bars, C.F., Pittsburgh	7.30*	7.30*	7.30*	6.85*	4.925
Shapes, Std., Pittsburgh	5.275	5.275	5.275	5.00	3.85
Shapes, Std., Chicago	5.275	5.275	5.275	5.00	3.85
Shapes, deld., Philadelphia	5.545	5.545	5.545	5.00	4.13
Plates, Pittsburgh	5.10	5.10	5.10	4.85	3.90
Plates, Chicago	5.10	5.10	5.10	4.85	3.90
Plates, Coatesville, Pa.	5.10	5.10	5.50	5.25	4.35
Plates, Sparrows Point, Md.	5.10	5.10	5.10	4.85	3.90
Plates, Claymont, Del.	5.70	5.70	5.70	5.35	4.35
Sheets, H.R., Pittsburgh	4.925	4.925	4.925	4.675	3.775
Sheets, H.R., Chicago	4.925	4.925	4.925	4.675	3.775
Sheets, C.R., Pittsburgh	6.05	6.05	6.05	5.75	4.575
Sheets, C.R., Chicago	6.05	6.05	6.05	5.75	4.575
Sheets, C.R., Detroit	6.05-6.15	6.05-6.15	6.05-6.15	5.75-5.85	4.775
Sheets, Galv., Pittsburgh	6.60	6.60	6.60	6.30	5.075
Strip, H.R., Pittsburgh	4.925	4.925	4.925	4.675	3.75-4.225
Strip, H.R., Chicago	4.925	4.925	4.925	4.675	3.725
Strip, C.R., Pittsburgh	7.15	7.15	7.15	6.85	5.10-5.80
Strip, C.R., Chicago	7.15	7.15	7.15	6.85	5.35
Strip, C.R., Detroit	7.25	7.25	7.25	6.95	5.30-6.05
Wire, Basic, Pittsburgh	7.65	7.65	7.65	7.20	5.10-5.225
Nails, Wire, Pittsburgh	8.95	8.95	8.95	8.20	6.20-6.35
Tin plate (1.50 lb) box, Pitts.	$10.30	$10.30	$10.30	$9.85	$8.95

*Including 0.35c for special quality.

SEMIFINISHED STEEL					
Billets, forging, Pitts. (NT)	$96.00	$96.00	$96.00	$91.50	$70.50
Wire rods, 1/2-5/8" Pitts.	6.15	6.15	6.15	5.80	4.325

PIG IRON, Gross Ton	Oct. 23 1957	Week Ago	Month Ago	Year Ago	5 Yr Ago
Bessemer, Pitts.	$67.00	$67.00	$67.00	$63.50	$55.50
Basic, Valley	66.00	66.00	66.00	62.50	54.50
Basic, deld., Phila.	70.01	70.01	70.01	66.26	59.25
No. 2 Fdry, NevilleIsland, Pa.	66.50	66.50	66.50	63.00	55.00
No. 2 Fdry, Chicago	66.50	66.50	66.50	63.00	55.00
No. 2 Fdry, deld., Phila.	70.51	70.51	70.51	66.76	59.75
No. 2 Fdry, Birm.	62.50	62.50	62.50	59.00	51.38
No. 2 Fdry (Birm.) deld. Cin.	70.20	70.20	70.20	66.70	58.93
Malleable, Valley	66.50	66.50	66.50	63.00	55.00
Malleable, Chicago	66.50	66.50	66.50	63.00	55.00
Ferromanganese, Duquesne	245.00†	245.00†	255.00†	235.00†	228.00*

†74-76% Mn, net ton. *75-82% Mn, gross ton, Etna, Pa.

SCRAP, Gross Ton (Including broker's commission)					
No. 1 Heavy Melt, Pittsburgh	$37.50	$38.50	$48.50	$55.50	$44.00
No. 1 Heavy Melt., E. Pa.	38.00	37.50	43.00	57.50	41.50
No. 1 Heavy Melt, Chicago	35.00	37.50	47.50	58.00	42.50
No. 1 Heavy Melt, Valley	35.50	36.50	43.50	63.50	44.00
No. 1 Heavy Melt, Cleve.	32.50	34.50	39.50	61.50	43.00
No. 1 Heavy Melt, Buffalo	36.50	38.50	47.50	57.50	43.00
Rails, Rerolling, Chicago	52.50	55.50	63.50	84.00	52.50
No. 1 Cast, Chicago	35.50	38.50	41.50	50.50	50.00

COKE, Net Ton					
Beehive, Furn., Connlsvl.	$15.25	$15.25	$15.25	$14.50	$14.75
Beehive, Fdry., Connlsvl.	18.25	18.25	18.25	17.50	17.00

Tension . . . by the ton!

While the air-powered Signode stretcher holds the strapping at its one-ton tension, the workman crimps the seal with a Signode air-powered sealer. The seal, the strap—and the tension—will hold, to keep this 4900-pound bundle of steel bars tight and secure to destination. What material other than steel strapping could do this job, could take and hold this tension, would cost so little, could be applied with air power to do the hard work fast? This hefty bundle is a good example of how—and why—Signode can make your product cost less to handle, store, ship and receive. To be specific, call your Signode man, or write:

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Steel Prices

Mill prices as reported to STEEL, Oct. 23, cents per pound except as otherwise noted. *Changes shown in italics.* Code numbers following mill points indicate producing company. Key to producers, page 268; to footnotes, page 270.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)
Munhall,Pa. U5 ....$73.50

INGOTS, Alloy (NT)
Detroit S41 .....$77.00
Farrell,Pa. S3 .....77.00
Lowellville,O. S3 .....77.00
Midland,Pa. C18 .....77.00
Munhall,Pa. U5 .....77.00
Sharon,Pa. S3 .....77.00

BILLETS, BLOOMS & SLABS
Carbon, Rerolling (NT)
Bessemer,Pa. U5 ....$77.50
Bridgeport,Conn. N19 ..80.50
Buffalo R2 .....77.50
Clairton,Pa. U5 .....77.50
Ensley,Ala. T2 .....77.50
Fairfield,Ala. T2 .....77.50
Fontana,Calif. K1 ....88.00
Gary,Ind. U5 .....77.50
Johnstown,Pa. B2 .....77.50
Lackawanna,N.Y. B2..77.50
Munhall,Pa. U5 .....77.50
S.Chicago,Ill. R2, U5..77.50
S.Duquesne,Pa. U5 ....77.50
Sterling,Ill. N15 .....77.50
Youngstown R2 .....77.50

Carbon, Forging (NT)
Bessemer,Pa. U5 ....$96.00
Bridgeport,Conn. N19..101.00
Buffalo R2 .....96.00
Canton,O. R2 .....98.50
Clairton,Pa. U5 .....96.00
Conshohocken,Pa. A3..101.00
Ensley,Ala. T2 .....96.00
Fairfield,Ala. T2 .....96.00
Fontana,Calif. K1 ...105.50
Gary,Ind. U5 .....96.00
Geneva,Utah C11 .....96.00
Houston S5 .....101.00
Johnstown,Pa. B2 ....96.00
Lackawanna,N.Y. B2..96.00
LosAngeles B3 .....105.50
Midland,Pa. C18 .....96.00
Munhall,Pa. U5 .....96.00
Seattle B3 .....109.50
Sharon,Pa. S3 .....96.00
S.Chicago R2,U5,W14..96.00
S.Duquesne,Pa. U5 ...96.00
S.SanFrancisco B3 ...105.50
Warren,O. C17 .....96.00

Alloy, Forging (NT)
Bethlehem,Pa. B2 ..$114.00
Bridgeport,Conn. N19..114.00
Buffalo R2 .....114.00
Canton,O. R2, T7 ....114.00
Conshohocken,Pa. A3..121.00
Detroit S41 .....114.00
Economy,Pa. B14 ....114.00
Farrell,Pa. S3 .....114.00
Fontana,Calif. K1 ....135.00
Gary,Ind. U5 .....114.00
Houston S5 .....119.00
Ind.Harbor,Ind. Y1 ..114.00
Johnstown,Pa. B2 ...114.00
Lackawanna,N.Y. B2..114.00
LosAngeles B3 .....134.00
Lowellville,O. S3 ....114.00
Massillon,O. R2 .....114.00
Midland,Pa. C18 .....114.00
Munhall,Pa. U5 .....114.00
Sharon,Pa. S3 .....114.00
S.Chicago R2,U5,W14..114.00
S.Duquesne,Pa. U5 ....114.00
Struthers,O. Y1 .....114.00
Warren,O. C17 .....114.00

ROUNDS, SEAMLESS TUBE (NT)
Bridgeport,Conn. N19 $122.50
Buffalo R2 .....117.50
Canton,O. R2 .....120.00
Cleveland,O. R2 .....117.50
Gary,Ind. U5 .....117.50
S.Chicago,Ill. R2, W14 117.50
S.Duquesne,Pa. U5 ....117.50
Warren,O. C17 .....117.50

SKELP
Aliquippa,Pa. J5 ....5.075
Munhall,Pa. U5 .....4.875
Warren,O. R2 .....4.875
Youngstown R2, U5 ..4.875

WIRE RODS
AlabamaCity,Ala. R2 ..6.15
Aliquippa,Pa. J5 .....6.15
Alton,Ill. L1 .....6.35
Buffalo W12 .....6.15
Cleveland A7 .....6.15
Donora,Pa. A7 .....6.15
Fairfield,Ala. T2 .....6.15
Houston S5 .....6.40
IndianaHarbor,Ind. Y1..6.15
Johnstown,Pa. B2 .....6.15
Joliet,Ill. A7 .....6.15
KansasCity,Mo. S5 ....6.40
Kokomo,Ind. C16 .....6.25
LosAngeles B3 .....6.95
Minnequa,Colo. C10 ....6.40
Monessen,Pa. P17 .....6.15
N.Tonawanda,N.Y. B11..6.15
Pittsburg,Calif. C11 ....6.95
Portsmouth,O. P12 ....6.15
Roebling,N.J. R5 .....6.25
S.Chicago,Ill. R2 .....6.15
SparrowsPoint,Md. B2 ..6.25
Sterling,Ill. (1) N15 ....6.15
Sterling,Ill. N15 .....6.25
Struthers,O. Y1 .....6.15
Worcester,Mass. A7 ....6.45

STRUCTURALS

Carbon Steel Std. Shapes
Ala.City,Ala. R2 ....5.275
Atlanta A11 .....5.475
Aliquippa,Pa. J5 ....5.275
Bessemer,Ala. T2 ....5.275
Bethlehem,Pa. B2 ....5.325
Birmingham C15 .....5.275
Clairton,Pa. U5 .....5.275
Fairfield,Ala. T2 .....5.275
Fontana,Calif. K1 ....6.075
Gary,Ind. U5 .....5.275
Geneva,Utah C11 .....5.275
Houston S5 .....5.375
Ind.Harbor,Ind. I-2 ...5.275
Johnstown,Pa. B2 ....5.325
Joliet,Ill. P22 .....5.275
KansasCity,Mo. S5 ....5.375
Lackawanna,N.Y. B2..5.325
LosAngeles B3 .....5.975
Minnequa,Colo. C10 ...5.575
Munhall,Pa. U5 .....5.275
Niles,Calif. P1 .....5.925
Phoenixville,Pa. P4 ...5.325
Portland,Oreg. O4 ....6.025
Seattle B3 .....6.025
S.Chicago,Ill. U5, W14..5.275
S.SanFrancisco B3 ....5.925
Sterling,Ill. N15 .....5.275
Torrance,Calif. C11 ...5.975
Weirton,W.Va. W6 ....5.275

Wide Flange
Bethlehem,Pa. B2 ....5.325
Clairton,Pa. U5 .....5.275
Fontana,Calif. K1 ....6.225
IndianaHarbor,Ind. I-2..5.525
Lackawanna,N.Y. B2..5.325
Munhall,Pa. U5 .....5.275
Phoenixville,Pa. P4 ...5.325
S.Chicago,Ill. U5 .....5.275

Alloy Std. Shapes
Aliquippa,Pa. J5 .....6.55
Clairton,Pa. U5 .....6.55
Gary,Ind. U5 .....6.55
Houston S5 .....6.65
KansasCity,Mo. S5 ....6.65
Munhall,Pa. U5 .....6.55
S.Chicago,Ill. U5 .....6.55

H.S., L.A. Std. Shapes
Aliquippa,Pa. J5 .....7.75
Bessemer,Ala. T2 .....7.75
Bethlehem,Pa. B2 .....7.80
Clairton,Pa. U5 .....7.75
Fairfield,Ala. T2 .....7.75
Fontana,Calif. K1 ....8.55
Gary,Ind. U5 .....7.75
Geneva,Utah C11 .....7.75
Houston S5 .....7.85
Ind.Harbor,Ind. I-2, Y1 7.75
Johnstown,Pa. B2 .....7.80
KansasCity,Mo. S5 ....7.85
Lackawanna,N.Y. B2 ...7.80
LosAngeles B3 .....8.45
Munhall,Pa. U5 .....7.75
Seattle B3 .....8.50
S.Chicago,Ill. U5, W14..7.75
S.SanFrancisco B3 ....8.40
Struthers,O. Y1 .....7.75

H.S., L.A. Wide Flange
Bethlehem,Pa. B2 .....7.80
Lackawanna,N.Y. B2 ...7.80
Munhall,Pa. U5 .....7.75
S.Chicago,Ill. U5 .....7.75

PILING

BEARING PILES
Bethlehem,Pa. B2 ....5.325
Lackawanna,N.Y. B2..5.325
Munhall,Pa. U5 .....5.275
S.Chicago,Ill. U5 .....5.275

STEEL SHEET PILING
Lackawanna,N.Y. B2 ..6.225
Munhall,Pa. U5 .....6.225
S.Chicago,Ill. U5 .....6.225

PLATES

PLATES, Carbon Steel
Ala.City,Ala. R2 .....5.10
Aliquippa,Pa. J5 .....5.10
Ashland,Ky. (15) A10 ..5.10
Bessemer,Ala. T2 .....5.10
Clairton,Pa. U5 .....5.10
Claymont,Del. C22 ....5.70
Cleveland J5, R2 .....5.20
Coatesville,Pa. L7 .....5.10
Conshohocken,Pa. A3 ..5.20
Ecorse,Mich. G5 .....5.20
Fairfield,Ala. T2 .....5.10
Fontana,Calif. (30) K1 .5.90
Gary,Ind. U5 .....5.10
Geneva,Utah C11 .....5.10
GraniteCity,Ill. G4 ....5.30
Harrisburg,Pa. P4 ....5.80
Houston S5 .....5.20
Ind.Harbor,Ind. I-2, Y1..5.10
Johnstown,Pa. B2 .....5.10
Lackawanna,N.Y. B2 ...5.10
LoneStar,Tex. L6 .....5.45
Mansfield,O. E6 .....5.10
Minnequa,Colo. C10 ....5.95
Munhall,Pa. U5 .....5.10
Newport,Ky. A2 .....5.10
Pittsburgh J5 .....5.10
Riverdale,Ill. A1 .....5.10
Seattle B3 .....6.00
Sharon,Pa. S3 .....5.10
S.Chicago,Ill. U5, W14 5.10
SparrowsPoint,Md. B2 ..5.10
Sterling,Ill. N15 .....5.10
Steubenville,O. W10 ....5.10
Warren,O. R2 .....5.10
Youngstown R2, U5, Y1..5.10

PLATES, Carbon Abras. Resist.
Claymont,Del. C22 .....7.35
Fontana,Calif. K1 .....7.55
Geneva,Utah C11 .....6.75
Houston S5 .....6.85
Johnstown,Pa. B2 .....6.75
SparrowsPoint,Md. B2 ..6.75

PLATES, Wrought Iron
Economy,Pa. B14 .....13.15

PLATES, H.S., L.A.
Aliquippa,Pa. J5 .....7.625
Bessemer,Ala. T2 .....7.625
Clairton,Pa. U5 .....7.625
Claymont,Del. C22 .....7.625
Cleveland J5, R2 .....7.625
Coatesville,Pa. L7 .....7.925
Conshohocken,Pa. A3 ..7.625
Economy,Pa. B14 .....7.625
Ecorse,Mich. G5 .....7.725
Fairfield,Ala. T2 .....7.625
Farrell,Pa. S3 .....7.625
Fontana,Calif. (30) K1 .8.425
Gary,Ind. U5 .....7.625
Geneva,Utah C11 .....7.625
Houston S5 .....7.725
Ind.Harbor,Ind. I-2, Y1 7.625
Johnstown,Pa. B2 .....7.625
Munhall,Pa. U5 .....7.625
Pittsburgh J5 .....7.625
Seattle B3 .....8.525
Sharon,Pa. S3 .....7.625
S.Chicago,Ill. U5, W14 7.625
SparrowsPoint,Md. B2..7.625
Warren,O. R2 .....7.625
Youngstown U5 .....7.625

PLATES, ALLOY
Aliquippa,Pa. J5 .....7.20
Claymont,Del. C22 .....7.20
Coatesville,Pa. L7 .....7.20
Economy,Pa. B14 .....7.20
Farrell,Pa. S3 .....7.20
Fontana,Calif. (30) K1 ..8.00
Gary,Ind. U5 .....7.20
Houston S5 .....7.30
Ind.Harbor,Ind. Y1 .....7.20
Johnstown,Pa. B2 .....7.20
Lowellville,O. S3 .....7.20
Munhall,Pa. U5 .....7.20
Newport,Ky. A2 .....7.20
Pittsburgh J5 .....7.20
Seattle B3 .....8.10
Sharon,Pa. S3 .....7.20
S.Chicago,Ill. U5, W14..7.20
SparrowsPoint,Md. B2 ..7.20
Youngstown Y1 .....7.20

FLOOR PLATES
Cleveland J5 .....6.175
Conshohocken,Pa. A3 ..6.175
Ind.Harbor,Ind. I-2....6.175
Munhall,Pa. U5 .....6.175
S.Chicago,Ill. U5 .....6.175

PLATES, Ingot Iron
Ashland c.l. (15) A10..5.35
Ashland l.c.l. (15) A10..5.85
Cleveland c.l. R2 .....5.85
Warren,O. c.l. R2 .....5.85

BARS

BARS, Hot-Rolled Carbon (Merchant Quality)
Ala.City,Ala.(9) R2 ..5.425
Aliquippa,Pa.(9) J5 ...5.425
Alton,Ill. L1 .....5.625
Atlanta(9) A11 .....5.625
Bessemer,Ala.(9) T2 ..5.425
Birmingham(9) C15 ...5.425
Bridgeport,Conn.(9) N19 5.65
Buffalo(9) R2 .....5.425
Clairton,Pa. (9) U5....5.425
Cleveland(9) R2 .....5.425
Ecorse,Mich.(9) G5....5.525
Emeryville,Calif. J7 ..6.175
Fairfield,Ala.(9) T2 ..5.425
Fairless,Pa. (9) U5....5.575
Fontana,Calif.(9) K1 ..6.125
Gary,Ind.(9) U5 .....5.425
Houston(9) S5 .....5.675
Ind.Harbor(9) I-2, Y1 5.425
Johnstown,Pa.(9) B2 ..5.425
Joliet,Ill. P22 .....5.425
KansasCity,Mo.(9) S5..5.675
Lackawanna(9) B2 ...5.425
LosAngeles(9) B3 ....6.125
Milton,Pa. M18 .....5.575
Minnequa,Colo. C10 ...5.875
Niles,Calif. P1 .....6.125
N.T'wanda,N.Y.(46)B11 5.775
Pittsburg,Calif.(9) C11..6.125
Pittsburgh(9) J5 .....5.425
Portland,Oreg. O4 ....6.175
Seattle B3, N14 .....6.175
S.Ch'c'go(9)R2,U5,W14 5.425
S.Duquesne,Pa.(9) U5..5.425
S.SanFran.,Calif.(9)B3 6.175
Sterling,Ill.(1)(9) N15..5.425
Sterling,Ill.(9) N15 ....5.525
Struthers,O. Y1 .....5.425
Tonawanda,N.Y. B12 ..5.425
Torrance,Calif.(9) C11..6.125
Youngstown(9) R2, U5..5.425

BARS, H.R. Leaded Alloy (Including leaded extra)
Warren,O. C17 .....7.475

BARS, Hot-Rolled Alloy
Aliquippa,Pa. J5 .....6.475
Bethlehem,Pa. B2 .....6.475
Bridgeport,Conn. N19 ..6.55
Buffalo R2 .....6.475
Canton,O. R2, T7 ....6.475
Clairton,Pa. U5 .....6.475
Detroit S41 .....6.475
Economy,Pa. B14 .....6.475
Ecorse,Mich. G5 .....6.575
Fairless,Pa. U5 .....6.625
Farrell,Pa. S3 .....6.475
Fontana,Calif. K1 ....7.525
Gary,Ind. U5 .....6.475
Houston S5 .....6.725
Ind.Harbor,Ind. I-2, Y1 6.475
Johnstown,Pa. B2 .....6.475
KansasCity,Mo. S5 ....6.725
Lackawanna,N.Y. B2 ...6.475
Lowellville,O. S3 .....6.475
LosAngeles B3 .....7.525
Massillon,O. R2 .....6.475
Midland,Pa. C18 .....6.475
Pittsburgh J5 .....6.475
Sharon,Pa. S3 .....6.475
S.Chicago R2, U5, W14 6.475
S. Duquesne,Pa. U5....6.475
Struthers,O. Y1 .....6.475
Warren,O. C17 .....6.475
Youngstown U5 .....6.475

BARS & SMALL SHAPES, H.R. High-Strength, Low-Alloy
Aliquippa,Pa. J5 .....7.925
Bessemer,Ala. T2 .....7.925
Bethlehem,Pa. B2 .....7.925
Bridgeport,Conn. N19 ..7.95
Clairton,Pa. U5 .....7.925
Cleveland R2 .....7.925
Ecorse,Mich. G5 .....8.025
Fairfield,Ala. T2 .....7.925
Fontana,Calif. K1 ....8.625
Gary,Ind. U5 .....7.925
Houston S5 .....8.175
Ind.Harbor,Ind. Y1 ....7.925
Johnstown,Pa. B2 .....7.925
KansasCity,Mo. S5 ....8.175
Lackawanna,N.Y. B2..7.925
LosAngeles B3 .....8.625
Pittsburgh J5 .....7.925
Seattle B3 .....8.675
S.Chicago,Ill. U5, W14 7.925
S.Duquesne,Pa. U5 ....7.925
S.SanFrancisco B3 ....8.675
Struthers,O. Y1 .....7.925
Youngstown U5 .....7.925

BAR SIZE ANGLES; H.R. Carbon
Bethlehem,Pa.(9) B2 ..5.575
Houston(9) S5 .....5.675
KansasCity,Mo.(9) S5..5.675
Lackawanna(9) B2 ...5.425
Sterling,Ill. N15 .....5.525
Sterling,Ill.(1) N15 ....5.425
Tonawanda,N.Y. B12 ..5.425

BAR SIZE ANGLES; S. Shapes
Aliquippa,Pa. J5 .....5.425
Atlanta A11 .....5.625
Joliet,Ill. P22 .....5.425
Niles,Calif. P1 .....6.125
Pittsburgh J5 .....5.425
Portland,Oreg. O4 ....6.175
SanFrancisco S7 .....6.275
Seattle B3 .....6.175

BAR SHAPES, Hot-Rolled Alloy
Aliquippa,Pa. J5 .....6.55
Clairton,Pa. U5 .....6.55
Gary,Ind. U5 .....6.55
Houston S5 .....6.80
KansasCity,Mo. S5 ....6.80
Pittsburgh J5 .....6.55
Youngstown U5 .....6.55

BARS, C.F., Leaded Alloy (Including leaded extra)
Ambridge,Pa. W18 ...9.925
BeaverFalls,Pa. M12 ..9.925
Camden,N.J. P13 ....10.10
Chicago W18 .....9.925
Cleveland C20 .....9.925
Elyria,O. W8 .....9.925
LosAngeles P2, S30
(Grade A) 11.30
(Grade B) 11.80
Monaca,Pa. S17 .....9.925
Newark,N.J. W18 ....10.10
SpringCity,Pa. K3 ....10.10
Warren,O. C17 .....9.925

BARS, Cold-Finished Carbon
Ambridge,Pa. W18 .....7.30
BeaverFalls,Pa. M12,R2 7.30
Birmingham C15 .....7.90
Bridgeport,Conn. N19 ..7.65
Buffalo B5 .....7.35
Camden,N.J. P13 .....7.75
Carnegie,Pa. C12 .....7.30
Chicago W18 .....7.30
Cleveland A7, C20 ....7.30
Detroit B5, P17 .....7.50
Detroit S41 .....7.30
Donora,Pa. A7 .....7.30
Elyria,O. W8 .....7.30
FranklinPark,Ill. N5 ...7.30
Gary,Ind. R2 .....7.30
GreenBay,Wis. F7 .....7.30
Hammond,Ind. J5, L2 ..7.30
Hartford,Conn. R2 ....7.80
Harvey,Ill. B5 .....7.30
LosAngeles (49), S30 ..8.75
LosAngeles P2, R2 ....8.75
Mansfield,Mass. B5 ....7.85
Massillon,O. R2, R8 ....7.30
Midland,Pa. C18 .....7.30
Monaca,Pa. S17 .....7.30
Newark,N.J. W18 .....7.75
NewCastle,Pa.(17) B4 ..7.30
Pittsburgh J5 .....7.30
Plymouth,Mich. P5 ....7.55
Putnam,Conn. W18 ....7.85
Readville,Mass. C14 ...7.85
S.Chicago,Ill. W14 ....7.30
SpringCity,Pa. K3 .....7.75
Struthers,O. Y1 .....7.30
Warren,O. C17 .....7.30
Willimantic,Conn. J5 ..7.80
Waukegan,Ill. A7 .....7.30
Youngstown F3, Y1 ....7.30

BARS, Cold-Finished Carbon (Turned and Ground)
Cumberland,Md.(5) C19..8.55

BARS, Cold-Finished Alloy
Ambridge,Pa. W18 ....8.775
BeaverFalls,Pa.M12,R2 8.775
Bethlehem,Pa. B2 .....8.775
Bridgeport,Conn. N19 ..8.925
Buffalo B5 .....8.775
Camden,N.J. P13 .....8.95
Canton,O. T7 .....8.775
Carnegie,Pa. C12 .....8.775
Chicago W18 .....8.775
Cleveland A7, C20 ....8.775
Detroit B5, P17 .....8.775
Detroit S41 .....8.775
Donora,Pa. A7 .....8.775
Elyria,O. W8 .....8.775
FranklinPark,Ill. N5 ...8.775
Gary,Ind. R2 .....8.775
GreenBay,Wis. F7 .....8.775
Hammond,Ind. J5, L2..8.775
Hartford,Conn. R2 ....9.075
Harvey,Ill. B5 .....8.775
Lackawanna,N.Y. B2 ..8.775
LosAngeles P2 .....10.65
LosAngeles S30 .....10.75
Mansfield,Mass. B5 ...9.075
Massillon,O. R2, R8 ...8.775
Midland,Pa. C18 .....8.775
Monaca,Pa. S17 .....8.775
Newark,N.J. W18 .....8.95
Plymouth,Mich. P5 ...8.975
S.Chicago W14 .....8.775
SpringCity,Pa. K3 .....8.96
Struthers,O. Y1 .....8.775
Warren,O. C17 .....8.775
Waukegan,Ill. A7 .....8.775
Worcester,Mass. A7....9.075
Youngstown F3, Y1 ..8.775

BARS, Reinforcing (To Fabricators)

Ala.City,Ala. R2 .....5.425
Atlanta A11 .....5.625
Birmingham C15, S42 5.425
Bridgeport,Conn. N19 ...5.65
Buffalo R2 .....5.425
Cleveland R2 .....5.425
Ecorse,Mich. G5 .....5.775
Emeryville,Calif. J7 ..6.175
Fairfield,Ala. T2 .....5.425
Fairless,Pa. U5 .....5.575
Fontana,Calif. K1 ....6.125
Ft.Worth,Tex.(4)(26)T4 5.875
Gary, Ind. U5 .....5.425
Houston S5 .....5.675
Ind.Harbor,Ind. I-2,Y1 5.425
Johnstown,Pa. B2 ....5.425
Joliet,Ill. P22 .....5.425
KansasCity,Mo. S5 ....5.675
Lackawanna,N.Y. B2 ..5.425
Los Angeles B3 .....6.125
Milton,Pa. M18 .....5.575
Minnequa,Colo. C10 ...5.875
Niles,Calif. P1 .....6.125
Pittsburg,Calif. C11 ..6.125
Pittsburgh J5 .....5.425
Portland,Oreg. O4 ....6.175
SandSprings,Okla. S5 ..5.925
Seattle B3, N14 .....6.175
S.Chicago,Ill. R2 .....5.425
S.Duquesne,Pa. U5 ....5.425
S.SanFrancisco B3 ....6.175
SparrowsPoint,Md. B2..5.425
Sterling,Ill.(1) N15 ...5.425
Sterling, Ill. N15 .....5.525
Struthers,O. Y1 .....5.425
Tonawanda,N.Y. B12 ...6.00
Torrance,Calif. C11 ....6.125
Youngstown R2, U5 ..5.425

BARS, Reinforcing (Fabricated; to Consumers)

Boston B2 .....7.56
Chicago U8 .....6.91
Cleveland U8 .....6.89
Johnstown,Pa. B2 .....7.08
KansasCity,Mo. S5 .....7.35
Lackawanna,N.Y. B2 ..6.85
Marion,O. P11 .....6.70
Newark,N.J. U8 .....7.55
Philadelphia U8 .....7.38
Pittsburgh J5, U8 ....7.10
Seattle B3, N14 .....7.70
SparrowsPt.,Md. B2 ....7.08
St.Paul U8 .....7.92
Williamsport,Pa. S19 ..7.00

BARS, Wrought Iron

Economy,Pa.(S.R.)B14 14.45
Economy,Pa.(D.R.)B14 18.00
Economy,(Staybolt)B14 18.45

RAIL STEEL BARS

ChicagoHts.(3) C2, I-2.5.325
ChicagoHts.(4)(44) I-2.5.425
ChicagoHts.(4) C2 ....5.425
Ft.Worth,Tex.(26) T4..5.875
Franklin,Pa. (3) F5 ..5.325
Franklin,Pa. (4) F5 ....5.425
JerseyShore,Pa.(3) J8 ..5.30
Marion,O.(3) P11 ....5.325
Tonawanda(3) R12 ....5.325
Tonawanda(4) B12 ....6.00
Williamsport,Pa. (3)S19 5.50

SHEETS

SHEETS, Hot-Rolled Steel (18 Gage and Heavier)

Ala.City,Ala. R2 ....4.925
Allenport,Pa. P7 .....4.925
Ashland,Ky.(8) A10 ..4.925
Cleveland J5, R2 ....4.925
Conshohocken,Pa. A3 ..4.975
Detroit(8) M1 .....5.025
Ecorse,Mich. G5 .....5.025
Fairfield,Ala. T2 .....4.925
Fairless,Pa. U5 .....4.975
Fontana,Calif. K1 ....5.825
Gary,Ind. U5 .....4.925
Geneva,Utah C11 .....5.025
GraniteCity,Ill.(8) G4 ..5.125
Ind.Harbor,Ind. I-2, Y1 4.925
Irvin,Pa. U5 .....4.925
Lackawanna,N.Y. B2 ..4.925
Mansfield,O. E6 .....4.925
Munhall,Pa. U5 .....4.925
Newport,Ky.(8) A2 ..4.925
Niles,O. M21, S3 ....4.925
Pittsburg,Calif. C11 ..5.625
Pittsburgh J5 .....4.925
Portsmouth,O. P12 ....4.925
Riverdale,Ill. A1 .....4.925
Sharon,Pa. S3 .....4.925
S.Chicago,Ill. W14 ....4.925
SparrowsPoint,Md. B2..4.925
Steubenville,O. W10 ...4.925
Warren,O. R2 .....4.925
Weirton,W.Va. W6 ....4.925
Youngstown U5, Y1 ..4.925

SHEETS, H.R., (19 Ga. & Lighter)

Niles,O. M21 .....6.05

SHEETS, H.R. Alloy

Gary,Ind. U5 .....8.10
Ind.Harbor,Ind. Y1 ....8.10
Irvin,Pa. U5 .....8.10
Munhall,Pa. U5 .....8.10
Newport,Ky. A2 .....8.10
Youngstown U5, Y1 ....8.10

SHEETS, H.R. (14 Ga. & Heavier) High-Strength, Low-Alloy

Cleveland J5, R2 ....7.275
Conshohocken,Pa. A3 ..7.325
Ecorse,Mich. G5 .....7.375
Fairfield,Ala. T2 .....7.275
Fairless,Pa. U5 .....7.325
Farrel,Pa. S3 .....7.275
Fontana,Calif. K1 .....8.175
Gary,Ind. U5 .....7.275
Ind.Harbor,Ind. I-2, Y1 7.275
Irvin,Pa. U5 .....7.275
Lackawanna (35) B2 ..7.275
Munhall,Pa. U5 .....7.275
Pittsburgh J5 .....7.275
S.Chicago,Ill. U5, W14 7.275
Sharon,Pa. S3 .....7.275
SparrowsPoint(36) B2..7.275
Warren,O. R2 .....7.275
Weirton,W.Va. W6 ....7.275
Youngstown U5, Y1 ..7.275

SHEETS, Hot-Rolled Ingot Iron (18 Gage and Heavier)

Ashland,Ky.(8) A10 ..5.175
Cleveland R2 .....5.675
Warren,O. R2 .....5.675

SHEETS, Cold-Rolled Ingot Iron

Cleveland R2 .....6.80
Middletown,O. A10 ....6.55
Warren,O. R2 .....6.80

SHEETS, Cold-Rolled Steel (Commercial Quality)

AlabamaCity,Ala. R2 ..6.05
Allenport,Pa. P7 .....6.05
Cleveland J5, R2 .....6.05
Conshohocken,Pa. A3 ..6.10
Detroit M1 .....6.05
Ecorse,Mich. G5 .....6.15
Fairfield,Ala. T2 .....6.05
Fairless,Pa. U5 .....6.10
Follansbee,W.Va. F4 ...6.05
Fontana,Calif. K1 ....7.30
Gary,Ind. U5 .....6.05
GraniteCity,Ill. G4 ....6.25
Ind.Harbor,Ind. I-2, Y1 6.05
Irvin,Pa. U5 .....6.05
Lackawanna,N.Y. B2 ..6.05
Mansfield,O. E6 .....6.05
Middletown,O. A10 .....6.05
Newport,Ky. A2 .....6.05
Pittsburg,Calif. C11 ....7.00
Pittsburgh J5 .....6.05
Portsmouth,O. P12 .....6.05
SparrowsPoint,Md. B2 ..6.05
Steubenville,O. W10 ....6.05
Warren,O. R2 .....6.05
Weirton,W.Va. W6 .....6.05
Yorkville,O. W10 .....6.05
Youngstown Y1 .....6.05

SHEETS, Cold-Rolled High-Strength, Low-Alloy

Cleveland J5, R2 ....8.975
Ecorse, Mich. G5 .....9.075
Fairless,Pa. U5 .....9.025
Fontana,Calif. K1 ....10.275
Gary,Ind. U5 .....8.975
IndianaHarbor,Ind. Y1 8.975
Irvin,Pa. U5 .....8.975
Lackawanna (37) B2 ..8.975
Pittsburgh J5 .....8.975
SparrowsPoint (38) B2 8.975
Warren,O. R2 .....8.975
Weirton,W.Va. W6 ....8.975
Youngstown Y1 .....8.975

SHEETS, Culvert	Cu Steel	Cu Fe
Ashland,Ky. A10	.6.95	7.20
Canton,O. R2	.6.95	7.45
Fairfield T2	.6.95	7.20
Gary,Ind. U5	.6.95	7.20
GraniteCity,Ill. G4	7.15	...
Ind.Harbor I-2	.6.95	7.20
Irvin,Pa. U5	.6.95	7.20
Kokomo,Ind. C16	7.05	...
MartinsFry. W10	.6.95	7.20
Pitts.,Calif. C11	.7.70	...
Pittsburgh J5	.6.95	...
SparrowsPt. B2	.6.95	...

SHEETS, Culvert—Pure Iron

Ind.Harbor,Ind. I-2 .. 7.20

SHEETS, Galvanized Steel Hot-Dipped

Ala.City,Ala. R2 .....6.60‡
Ashland,Ky. A10 .....6.60†
Canton,O. R2 .....6.60‡
Dover,O. R1 .....6.60†
Fairfield,Ala. T2 .....6.60†
Gary,Ind. U5 .....6.60*
GraniteCity,Ill. G4 ....6.80*
Ind.Harbor,Ind. I-2 ....6.60†
Irvin,Pa. U5 .....6.60*
Kokomo,Ind. C16 ....6.70‡
MartinsFerry,O. W10 ...6.60*
Middletown,O. A10 ....6.60†
Pittsburg,Calif. C11 ....7.35*
Pittsburgh J5 .....6.60†
SparrowsPt.,Md. B2 ....6.60†
Warren,O. R2 .....6.60†
Weirton,W.Va. W6 ....6.60*

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana,Calif. K1 ....7.325

SHEETS, Galvanized High-Strength, Low-Alloy

Irvin,Pa. U5 .....9.725
SparrowsPt.(39) B2 ...9.725

SHEETS, Galvannealed Steel

Canton,O. R2 .....7.00
Irvin,Pa. U5 .....7.00

SHEETS, Galvanized Ingot Iron (Hot-Dipped Continuous)

Ashland,Ky. A10 .....6.85
Middletown,O. A10 ....6.85

SHEETS, Electrogalvanized

Cleveland (28) R2 ....7.425
Niles,O. (28) R2 .....7.425
Weirton,W.Va. W6 ...7.275

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1).9.25
Butler,Pa. A10 (type 2).9.35

SHEETS, Enameling Iron

Ashland,Ky. A10 .....6.625
Cleveland R2 .....6.625
Gary,Ind. U5 .....6.625
GraniteCity,Ill. G4 ....6.825
Ind.Harbor,Ind. I-2,Y1 6.625
Irvin,Pa. U5 .....6.625
Middletown,O. A10 ....6.625
Niles,O. M21, S3 .....6.625
Youngstown Y1 .....6.625

BLUED STOCK, 29 Gage

Follansbee,W.Va. F4 ...8.65
Ind.Harbor,Ind. I-2 ...8.475
Yorkville,O. W10 .....8.475

SHEETS, Long Terne Steel (Commercial Quality)

BeechBottom,W.Va.W10 7.00
Gary,Ind. U5 .....7.00
Mansfield,O. E6 .....7.00
Middletown,O. A10 ....7.00
Niles,O. M21, S3 .....7.00
Warren,O. R2 .....7.00
Weirton,W.Va. W6 ....7.00

SHEETS, Long Terne, Ingot Iron

Middeltown,O. A10 .....7.40

Key to Producers

A1 Acme Steel Co.
A2 Acme-Newport Steel Co.
A3 Alan Wood Steel Co.
A4 Allegheny Ludlum Steel
A5 Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6 American Shim Steel Co.
A7 American Steel & Wire Div., U. S. Steel Corp.
A8 Anchor Drawn Steel Co.
A9 Angell Nail & Chaplet
A10 Armco Steel Corp.
A11 Atlantic Steel Co.

B1 Babcock & Wilcox Co.
B2 Bethlehem Steel Co.
B3 Beth. Pac. Coast Steel
B4 Blair Strip Steel Co.
B5 Bliss & Laughlin Inc.
B8 Braeburn Alloy Steel
B9 Brainard Steel Div., Sharon Steel Corp.
B10 E. & G. Brooke, Wickwire Spencer Steel Div., Colo. Fuel & Iron
B11 Buffalo Bolt Co., Div., Buffalo-Eclipse Corp.
B12 Buffalo Steel Corp.
B14 A. M. Byers Co.
B15 J. Bishop & Co.

C1 Calstrip Steel Corp.
C2 Calumet Steel Div., Borg-Warner Corp.
C4 Carpenter Steel Co.
C7 Cleve.Cold Rolling Mills
C9 Colonial Steel Co.
C10 Colorado Fuel & Iron
C11 Columbia-Geneva Steel
C12 Columbia Steel & Shaft.
C13 Columbia Tool Steel Co.
C14 Compressed Steel Shaft.
C15 Connors Steel Div., H. K. Porter Co. Inc.
C16 Continental Steel Corp.
C17 Copperweld Steel Co.
C18 Crucible Steel Co.
C19 Cumberland Steel Co.
C20 Cuyahoga Steel & Wire
C22 Claymont Plant, Wickwire Spencer Steel Div., Colo. Fuel & Iron
C23 Charter Wire Inc.
C24 G. O. Carlson Inc.

D2 Detroit Steel Corp.
D3 Dearborn Div. Sharon Steel Corp.
D4 Disston Div. H. K. Porter Co. Inc.
D6 Driver-Harris Co.
D7 Dickson Weatherproof Nail Co.
D8 Damascus Tube Co.
D9 Wilbur B. Driver Co.

E1 EasternGas&FuelAssoc.
E2 Eastern Stainless Steel
E4 Electro Metallurgical Co.
E5 Elliott Bros. Steel Co.
E6 Empire Steel Corp.

F2 Firth Sterling Inc.
F3 Fitzsimmons Steel Co.
F4 Follansbee Steel Corp.
F5 Franklin Steel Div., Borg-Warner Corp.
F6 Fretz-Moon Tube Co.
F7 Ft. Howard Steel & Wire
F8 Ft. Wayne Metals Inc.

G4 Granite City Steel Co.
G5 Great Lakes Steel Corp.
G6 Greer Steel Co.
G8 Green River Steel Corp.

H1 Hanna Furnace Corp.
H7 Helical Tube Co.

I-1 Igoe Bros. Inc.
I-2 Inland Steel Co.
I-3 Interlake Iron Corp.
I-4 Ingersoll Steel Div., Borg-Warner Corp.
I-6 Ivins, E., Steel Tube
I-7 Indiana Steel & Wire Co.

J1 Jackson Iron & Steel Co.
J3 Jessop Steel Co.
J4 Johnson Steel & Wire Co.
J5 Jones & Laughlin Steel
J6 Joslyn Mfg. & Supply
J7 Judson Steel Corp.
J8 Jersey Shore Steel Co.

K1 Kaiser Steel Corp.
K2 Keokuk Electro-Metals
K3 Keystone Drawn Steel
K4 Keystone Steel & Wire
K7 Kenmore Metals Corp.

L1 Laclede Steel Co.
L2 LaSalle Steel Co.
L3 Latrobe Steel Co.
L6 Lone Star Steel Co.
L7 Lukens Steel Co.

M1 McLouth Steel Corp.
M4 Mahoning Valley Steel
M6 Mercer Pipe Div., Sawhill Tubular Products
M8 Mid-States Steel & Wire
M12 Moltrup Steel Products
M14 McInnes Steel Co.
M16 Md.Fine & Special. Wire
M17 Metal Forming Corp.
M18 Milton Steel Div. Merritt-Chapman&Scott
M21 Mallory-Sharon Titanium Corp.
M22 Mill Strip Products Co.

N1 National Standard Co.
N2 National Supply Co.
N3 National Tube Div., U. S. Steel Corp.
N5 Nelson Steel & Wire Co.
N6 New England High Carbon Wire Co.
N8 Newman-Crosby Steel
N9 Newport Steel Corp.
N14 Northwest.SteelRoll.Mill
N15 Northwestern S.&W. Co.
N19 Northeastern Steel Corp.

O4 Oregon Steel Mills

P1 Pacific States Steel Corp.
P2 Pacific Tube Co.
P4 Phoenix Iron & Steel Co. Sub. of Barium Steel Corp.
P5 Pilgrim Drawn Steel
P6 Pittsburgh Coke & Chem.
P7 Pittsburgh Steel Co.
P11 Pollak Steel Co.
P12 Portsmouth Div. Detroit Steel Corp.
P13 Precision Drawn Steel
P14 Pitts. Screw & Bolt Co.
P15 Pittsburgh Metallurgical
P16 Page Steel & Wire Div., Amer. Chain & Cable
P17 Plymouth Steel Co.
P19 Pitts. Rolling Mills
P20 Prod. Steel Strip Corp.
P22 Phoenix Mfg. Co.
P24 Phil. Steel & Wire Corp.

R1 Reeves Steel & Mfg. Co.
R2 Republic Steel Corp.
R3 Rhode Island Steel Corp.
R5 Roebling's Sons, John A.
R6 Rome Strip Steel Co.
R8 Reliance Div.,EatonMfg.
R9 Rome Mfg. Co.
R10 Rodney Metals Inc.

S1 Seneca Wire & Mfg. Co.
S3 Sharon Steel Corp.
S4 Sharon Tube Co.
S5 Sheffield Steel Div., Armco Steel Corp.
S6 Shenango Furnace Co.
S7 Simmons Co.
S8 Simonds Saw & Steel Co.
S12 Spencer Wire Corp.
S13 Standard Forgings Corp.
S14 Standard Tube Co.
S15 Stanley Works
S17 Superior Drawn Steel Co.
S18 Superior Steel Corp.
S19 Sweet's Steel Co.
S20 Southern States Steel
S23 Superior Tube Co.
S25 Stainless Welded Prod.
S26 Specialty Wire Co. Inc.
S30 Sierra Drawn Steel Corp.
S40 Seneca Steel Service
S41 Stainless Steel Div., J&L Steel Corp.
S42 Southern Elec. Steel Co.
T2 Tenn. Coal & Iron Div., U. S. Steel Corp.
T3 Tenn. Prod. & Chem.
T4 Texas Steel Co.
T5 Thomas Strip Div. Pittsburgh Steel Co.
T6 Thompson Wire Co.
T7 Timken Roller Bearing
T9 Tonawanda Iron Div., Am. Rad. & Stan. San.
T13 Tube Methods Inc.
T19 Techalloy Co. Inc.

U4 Universal-Cyclops Steel
U5 United States Steel Corp.
U6 U. S. Pipe & Foundry
U7 Ulbrich Stainless Steels
U8 U. S. Steel Supply Div., U. S. Steel Corp.

V2 Vanadium-Alloys Steel
V3 Vulcan Crucible Div., H. K. Porter Co. Inc.

W1 Wallace Barnes Co.
W2 Wallingford Steel Co.
W3 Washburn Wire Co.
W4 Washington Steel Corp.
W6 Weirton Steel Co.
W8 Western Automatic Machine Screw Co.
W9 Wheatland Tube Co.
W10 Wheeling Steel Corp.
W12 Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13 Wilson Steel & Wire Co.
W14 Wisconsin Steel Div., International Harvester
W15 Woodward Iron Co.
W18 Wyckoff Steel Co.

Y1 Youngstown Sheet&Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala.(27) R2	4.925
Allenport,Pa. P7	4.925
Alton,Ill. L1	5.125
Ashland,Ky.(8) A10	4.925
Atlanta A11	5.125
Bessemer,Ala. T2	4.925
Birmingham C15	4.925
Buffalo (27) R2	4.925
Conshohocken,Pa. A3	4.975
Detroit M1	5.025
Ecorse,Mich. G5	5.025
Fairfield,Ala. T2	4.925
Fontana, Calif. K1	5.825
Gary,Ind. U5	4.925
Ind.Harbor,Ind. I-2, Y1	4.925
Johnstown,Pa. (25) B2	4.925
Lackaw'na,N.Y.(25) B2	4.925
LosAngeles(25) B3	5.675
Minnequa, Colo. C10	6.025
Pittsburg,Calif. C11	5.675
Riverdale,Ill. A1	4.925
SanFrancisco S7	6.35
Seattle(25) B3	6.35
Seattle N14	6.35
Sharon,Pa. S3	4.925
S.SanFrancisco(25) B3	5.675
SparrowsPoint,Md. B2	4.925
Sterling,Ill. (1) N15	4.925
Sterling,Ill. N15	5.025
Torrance,Calif. C11	5.675
Warren,O. R2	4.925
Weirton,W.Va. W6	4.925
Youngstown U5	4.925

STRIP, Hot-Rolled Alloy

Carnegie,Pa. S18	8.10
Farrell,Pa. S3	8.10
Gary,Ind. U5	8.10
Houston S5	8.35
Ind.Harbor,Ind. Y1	8.10
KansasCity,Mo. S5	8.35
LosAngeles B3	9.30
Lowellville,O. S3	8.10
Newport,Ky. A2	8.10
Sharon,Pa. S3	8.10
S.Chicago,Ill. W14	8.10
Youngstown U5, Y1	8.10

STRIP, Hot-Rolled High-Strength, Low-Alloy

Bessemer,Ala. T2	7.325
Conshohocken,Pa. A3	7.325
Ecorse,Mich. G5	7.425
Fairfield,Ala. T2	7.325
Farrell,Pa. S3	7.325
Gary,Ind. U5	7.325
Ind.Harbor,Ind. I-2, Y1	7.325
Lackawanna,N.Y. B2	7.325
LosAngeles(25) B3	8.075
Seattle(25) B3	8.325
Sharon,Pa. S3	7.325
S.Chicago,Ill. W14	7.325
S.SanFrancisco(25) B3	8.075
SparrowsPoint,Md. B2	7.325
Warren,O. R2	7.325
Weirton,W.Va. W6	7.325
Youngstown U5, Y1	7.325

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10	5.175
Warren,O. R2	5.675

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6	7.15
Baltimore T6	7.15
Boston T6	7.70
Buffalo S40	7.15
Cleveland A7, J5	7.15
Conshohocken,Pa. A3	7.20
Dearborn,Mich. D3	7.25
Detroit D2, M1, P20	7.25
Dover,O. G6	7.15
Ecorse,Mich. G5	7.25
Evanston,Ill. M22	7.25
Follansbee,W.Va. F4	7.15
Fontana,Calif. K1	9.00
Franklin Park,Ill. T6	7.25
Ind.Harbor,Ind. Y1	7.15
Indianapolis J5	7.30
LosAngeles J5	9.05
LosAngeles C1	9.20
NewBedford,Mass. R10	7.60
NewBritain(10) S15	7.15
NewCastle,Pa. B4, E5	7.15
NewHaven,Conn. D2	7.60
NewKensington,Pa. A6	7.15
Pawtucket,R.I. R3	7.80
Pawtucket,R.I. N8	7.70
Philadelphia(45) P24	7.70
Pittsburgh J5	7.15
Riverdale,Ill. A1	7.25
Rome,N.Y. (32) R6	7.15
Sharon,Pa. S3	7.15
Trenton,N.J. (31) R5	8.60
Wallingford,Conn. W2	7.60
Warren,O. R2, T5	7.15
Weirton,W.Va. W6	7.15
Worcester,Mass. A7	7.70
Youngstown J5, Y1	7.15

STRIP, Cold-Rolled Alloy

Boston T6	15.40
Carnegie,Pa. S18	15.05
Cleveland A7	15.05
Dover,O. G6	15.05
Farrell,Pa. S3	15.05
FranklinPark,Ill. T6	15.05
Harrison,N.J. C18	15.05
Indianapolis J5	15.20
Lowellville,O. S3	15.05
Pawtucket,R.I. N8	15.40
Riverdale,Ill. A1	15.05
Sharon,Pa. S3	15.05
Worcester,Mass. A7	15.35
Youngstown J5	15.05

STRIP, Cold-Rolled High-Strength, Low-Alloy

Cleveland A7	10.45
Dearborn,Mich. D3	10.60
Dover,O. G6	10.45
Ecorse,Mich. G5	10.55
Farrell,Pa. S3	10.50
Ind.Harbor,Ind. Y1	10.65
Sharon,Pa. S3	10.50
Warren,O. R2	10.45

STRIP, Cold-Finished Spring Steel (Annealed)	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	9.50	10.70	12.90	15.90	18.85
Boston T6	9.50	10.70	12.90	15.90	18.85
Bristol,Conn. W1	...	10.70	12.90	16.10	19.30
Carnegie,Pa. S18	8.95	10.40	12.60	15.60	....
Cleveland A7	8.95	10.40	12.60	15.60	18.55
Dearborn,Mich. D3	9.05	10.50	12.70	....	....
Detroit D2	9.05	10.50	12.70	15.70	....
Dover,O. G6	8.95	10.40	12.60	15.60	18.55
Evanston,Ill. M22	8.95	10.40	12.60	....	....
Fostoria,O. S1	10.05	11.15	13.10	16.10	....
FranklinPark,Ill. T6	9.05	10.40	12.60	15.60	18.55
Harrison,N.J. C18	...	....	12.90	16.10	19.30
Indianapolis J5	9.10	10.55	12.60	15.60	18.55
LosAngeles C1	11.15	12.60	14.80	17.80	....
LosAngeles J5	11.15	12.60	14.80	....	....
NewBritain,Conn.(10) S15	8.95	10.40	12.60	15.60	18.55
NewCastle,Pa. B4, E5	8.95	10.40	12.60	15.60	....
NewHaven,Conn. D2	9.40	10.70	12.90	15.90	....
NewKensington,Pa. A6	8.95	10.40	12.60	15.60	....
NewYork W3	...	10.70	12.90	16.10	19.30
Pawtucket,R.I. N8	9.50	10.70	12.90	15.90	18.85
Riverdale,Ill. A1	9.05	10.40	12.60	15.60	18.55
Rome,N.Y.(32) R6	8.95	10.40	12.60	15.60	18.55
Sharon,Pa. S3	8.95	10.40	12.60	15.60	18.55
Trenton,N.J. R5	...	10.70	12.90	16.10	19.30
Wallingford,Conn. W2	9.40	10.70	12.90	15.90	18.75
Warren,O. T5	8.95	10.40	12.60	15.60	18.55
Worcester,Mass. A7, T6	9.50	10.70	12.90	15.90	18.85
Youngstown J5	8.95	10.40	12.60	15.60	18.55

Spring Steel (Tempered)	Up to 0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	18.10	21.95	26.30
Buffalo W12	18.10	....	....
Fostoria,O. S1	18.30	22.15	....
FranklinPark,Ill. T6	18.45	22.30	26.65
Harrison,N.J. C18	18.10	21.95	26.30
NewYork W3	18.10	21.95	26.30
Palmer,Mass. W12	18.10	....	....
Trenton,N.J. R5	18.10	21.95	26.30
Worcester,Mass. A7, T6	18.10	21.95	26.30
Youngstown J5	18.45	22.30	26.65

Weirton,W.Va. W6	10.50
Youngstown Y1	10.65

STRIP, Cold-Rolled Ingot Iron

Warren,O. R2	7.90

STRIP, C.R. Electrogalvanized

Cleveland A7	7.15*
Dover,O. G6	7.15*
Evanston,Ill. M22	7.25*
Riverdale,Ill. A1	7.25*
Warren,O. B9, T5	7.15*
Worcester,Mass. A7	7.70*
Youngstown J5	7.15*

*Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Sharon,Pa. S3	7.275

TIGHT COOPERAGE HOOP

Atlanta A11	5.65
Riverdale,Ill. A1	5.50
Sharon,Pa. S3	5.35
Youngstown U5	5.35

SILICON STEEL

H.R.SHEETS(22 Ga.,cut lengths)	Field	Armature	Electric	Motor	Dynamo
BeechBotton,W.Va. W10	....	....	11.80	12.90	13.95
Mansfield,O. E6	9.625	11.10	11.80	12.90	13.95
Newport,Ky. A2	9.625	11.10	11.80	12.90	13.95
Niles,O. M21, S3	9.625	11.10	11.80	12.90	....
Vandergrift,Pa. U5	....	11.10	11.80	12.90	13.95
Warren,O. R2	9.625	11.10	11.80	12.90	....
Zanesville,O. A10	....	11.10	11.80	12.90	13.95
Zanesville,O. A10 (SP Coils)	....	....	11.55	12.65	13.70

C.R. COILS & CUT LENGTHS (22 Ga.)

Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	....	11.35	12.05	13.15	14.20
Brackenridge,Pa. A4	....	....	12.05	13.15	14.20
GraniteCity,Ill. G4	9.825*	11.05*	11.75*	12.85*	....
IndianaHarbor,Ind. I-2..	9.625†	10.85*	11.55*	12.65*	....
Mansfield,O. E6	9.625*	11.35	12.05	13.50	14.20
Vandergrift,Pa. U5	9.625*	11.35	12.05	13.15	14.20
Warren,O. R2	9.625*	11.35	12.05	13.15	14.20
Zanesville,O. A10 (FP Coils)	...	11.35	12.05	13.15	14.20

H.R. SHEETS (22Ga., cut lengths)	Transformer Grades T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	15.00	15.55	16.05	17.10
Vandergrift,Pa. U5	14.75	15.55	16.05	17.10
Zanesville,O. A10	15.00	15.55	16.05	17.10

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	17.60	19.20	19.70	20.20	....
Butler,Pa. A10	....	....	....	19.20	19.70	20.20	....
Vandergrift,Pa. U5	..	16.60	17.60	19.20	19.70	20.20	15.25**
Warren,O. R2	....	....	....	....	....	....	15.25‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½c lower. **Cut lengths, ¾-cent lower.

TIN MILL PRODUCTS

TIN PLATE, Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$8.75	$9.00	$9.40
Fairfield,Ala. T2	8.85	9.10	9.50
Fairless,Pa. U5	8.85	9.10	9.50
Fontana,Calif. K1	9.50	9.75	10.15
Gary,Ind. U5	8.75	9.00	9.40
GraniteCity,Ill. G4	8.85	9.10	9.50
IndianaHarbor,Ind. I-2, Y1	8.75	9.00	9.40
Irvin,Pa. U5	8.75	9.00	9.40
Niles,O. R2	8.75	9.00	9.40
Pittsburg,Calif. C11	9.50	9.75	10.15
SparrowsPoint,Md. B2	8.85	9.10	9.50
Weirton,W.Va. W6	8.75	9.00	9.40
Yorkville,O. W10	8.75	9.00	9.40

ELECTROTIN (22-27 Gage; Dollars per 100 lb)			
Aliquippa,Pa. J5	7.725	7.925	....
Niles,O. R2	7.725	7.925	8.125

TINPLATE, American	1.25 lb	1.50 lb
Aliquippa,Pa.J5	$10.05	$10.30
Fairfield,Ala.T2	10.15	10.40
Fairless,Pa. U5	10.15	10.40
Fontana,Calif.K1	10.80	11.05
Gary,Ind. U5	10.05	10.30
Irvin,Pa. U5	10.05	10.30
Pitts.,Calif. C11	10.80	11.05
Sp.Pt.,Md. B2	10.15	10.40
Weirton,W.Va.W6	10.05	10.30
Yorkville,O. W10	10.05	10.30

BLACK PLATE (Base Box)	
Aliquippa,Pa. J5	$7.85
Fairfield,Ala. T2	7.95
Fairless,Pa. U5	7.95
Fontana,Calif. K1	8.60
Gary Ind. U5	7.85
GraniteCity,Ill. G4	7.95
Ind.Harbor,Ind. I-2, Y1	7.85
Irvin,Pa. U5	7.85
Niles,O. R2	7.85
Pittsburg,Calif. C11	8.60
SparrowsPoint,Md. B2	7.95
Weirton,W.Va. W6	7.85
Yorkville,O. W10	7.85

HOLLOWARE ENAMELING Black Plate (29 Gage)

Aliquippa,Pa. J5	$7.50
Gary,Ind. U5	7.50
GraniteCity,Ill. G4	7.60
Ind.Harbor,Ind. Y1	7.50
Irvin,Pa. U5	7.50
Yorkville,O. W10	7.50

MANUFACTURING TERNES (Special Coated, Base Box)

Gary,Ind. U5	$9.70
Irvin,Pa. U5	9.70

ROOFING SHORT TERNES (8 lb Coated, Base Box)

Gary,Ind. U5	$11.25

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2	7.65
Aliquippa,Pa. J5	7.65
Alton,Ill. L1	7.85
Atlanta A11	7.85
Bartonsville,Ill. K4	7.75
Buffalo W12	7.65
Chicago W13	7.65
Cleveland A7, C20	7.65
Crawfordsville,Ind. M8	7.75
Donora,Pa. A7	7.65
Duluth A7	7.65
Fairfield,Ala. T2	7.65
Fostoria,O.(24) S1	7.75
Houston S5	7.90
Jacksonville,Fla. M8	8.00
Johnstown,Pa. B2	7.65
Joliet,Ill. A7	7.65
KansasCity,Mo. S5	7.90
Kokomo,Ind. C16	7.75
LosAngeles B3	8.60
Minnequa,Colo. C10	7.90
Monessen,Pa. P7, P16	7.65
N.Tonawanda,N.Y. B11	7.65
Palmer,Mass. W12	7.95
Pittsburg,Calif. C11	8.60
Portsmouth,O. P12	7.65
Rankin,Pa. A7	7.65
S.Chicago,Ill. R2	7.65
S.SanFrancisco C10	8.60
SparrowsPoint,Md. B2	7.75
Sterling,Ill.(1) N15	7.65
Sterling,Ill. N15	7.75
Struthers,O. Y1	7.65
Waukegan,Ill. A7	7.65
Worcester,Mass. A7	7.95

WIRE, Gal'd ACSR for Cores

Bartonville,Ill. K4	12.65
Buffalo W12	12.65
Cleveland A7	12.65
Donora,Pa. A7	12.65
Duluth A7	12.65
Johnstown,Pa. B2	12.65
Minnequa,Colo. C10	12.775
Monessen,Pa. P16	12.65
Muncie,Ind. I-7	12.85
New Haven,Conn. A7	12.95
Palmer,Mass. W12	12.95
Pittsburg,Calif. C11	13.45
Portsmouth,O. P12	12.65
Roebling,N.J. R5	12.95
SparrowsPt.,Md. B2	12.75
Struthers,O. Y1	12.65
Trenton,N.J. A7	12.95
Waukegan,Ill. A7	12.65
Worcester,Mass. A7	12.95

WIRE, Upholstery Spring

Aliquippa,Pa. J5	9.30
Alton,Ill. L1	9.50
Buffalo W12	9.30
Cleveland A7	9.30
Donora,Pa. A7	9.30
Duluth A7	9.30
Johnstown,Pa. B2	9.30
KansasCity,Mo. S5	9.55
LosAngeles B3	10.25
Minnequa,Colo. C10	9.50
Monessen,Pa. P7, P16	9.30
NewHaven,Conn. A7	9.60
Palmer,Mass. W12	9.60
Pittsburg,Calif. C11	10.25
Portsmouth,O. P12	9.30
Roebling,N.J. R5	9.60
S.Chicago,Ill. R2	9.30
S.SanFrancisco C10	10.25
SparrowsPt.,Md. B2	9.40
Struthers,O. Y1	9.30
Trenton,N.J. A7	9.60
Waukegan,Ill. A7	9.30
Worcester,Mass. A7	9.60

WIRE, MB Spring, High Carbon

Aliquippa,Pa. J5	9.30
Alton,Ill. L1	9.50
Bartonville,Ill. K4	9.40
Buffalo W12	9.30
Cleveland A7	9.30
Donora,Pa. A7	9.30
Duluth A7	9.30
Fostoria,O. S1	9.35
Johnstown,Pa. B2	9.30
KansasCity,Mo. S5	9.55
LosAngeles B3	10.25
Milbury,Mass.(12) N6	9.60
Minnequa,Colo. C10	9.50
Monessen,Pa. P7, P16	9.30
Muncie,Ind. I-7	9.50
Palmer,Mass.(12) W12	9.60
Pittsburg,Calif. C11	10.25
Portsmouth,O. P12	9.30
Roebling,N.J. R5	9.60
S.Chicago,Ill. R2	9.30
S.SanFrancisco C10	10.25
SparrowsPt.,Md. B2	9.40
Struthers,O. Y1	9.30
Trenton,N.J. A7	9.60
Waukegan,Ill. A7	9.30
Worcester,A7, J4, T6	9.60

WIRE, Fine & Weaving (8" Coils)

Alton,Ill. L1	15.80
Bartonville,Ill. K4	15.70
Buffalo W12	15.60
Chicago W13	15.60
Cleveland A7	15.60
Crawfordsville,Ind. M8	15.70
Fostoria,O. S1	15.60
Houston S5	15.85
Jacksonville,Fla. M8	15.95
Johnstown,Pa. B2	15.60
KansasCity,Mo. S5	15.85
Kokomo,Ind. C16	15.60
Minnequa,Colo. C10	15.85
Monessen,Pa. P7, P16	15.60
Muncie,Ind. I-7	15.80
Palmer,Mass. W12	15.90
S.SanFrancisco C10	16.45
Waukegan,Ill. A7	15.60
Worcester,Mass. A7, T6	15.90

ROPE WIRE

Bartonville,Ill. K4	12.75
Buffalo W12	12.75
Fostoria,O. S1	12.75
Johnstown,Pa. B2	12.75
Monessen,Pa. P7	12.75
Muncie,Ind. I-7	12.95
Palmer,Mass. W12	13.05
Portsmouth,O. P12	12.75
Roebling,N.J. R5	13.05
SparrowsPt.,Md. B2	12.85
Struthers,O. Y1	12.75
Worcester,Mass. J4	13.05

(A) Plow and Mild Plow; add 0.25c for Improved Plow

WIRE, Tire Bead

Bartonville,Ill. K4	....16.55
Monessen,Pa. P16	....16.55
Roebling,N.J. R5	....17.05

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	....11.65
Baltimore T6	....11.95
Boston T6	....11.95
Buffalo W12	....11.65
Chicago W13	....11.75
Cleveland A7	....11.65
Crawfordsville,Ind. M8	..11.65
Dover,O. G6	....11.65
Fostoria,O. S1	....11.95
FranklinPark,Ill. T6	..11.75
Kokomo,Ind. C16	....11.65
Massillon,O. R8	....11.65
Milwaukee C23	....11.85
Monessen,Pa. P7, P16	..11.65
Palmer,Mass. W12	....11.95
Pawtucket,R.I. N8	....11.95
Philadelphia P24	....11.95
Riverdale,Ill. A1	....11.75
Rome,N.Y. R6	....11.65
Sharon,Pa. S3	....11.65
Trenton,N.J. R5	....11.95
Warren,O. B9	....11.65
Worcester,Mass. A7, T6	11.95

NAILS, Stock

	Col.
AlabamaCity,Ala. R2	...173
Aliquippa,Pa. J5	173
Atlanta A11	175
Bartonville,Ill. K4	175
Chicago W13	173
Cleveland A9	173
Crawfordsville,Ind. M8	..175
Donora,Pa. A7	173
Duluth A7	173
Fairfield,Ala. T2	173
Houston,Tex. S5	178
Jacksonville,Fla.(20) M8	.184
Johnstown,Pa. B2	173
Joliet,Ill. A7	173
KansasCity,Mo. S5	178
Kokomo,Ind. C16	175
Minnequa,Colo. C10	...178
Monessen,Pa. P7	173
Pittsburg,Calif. C11	...192
Rankin,Pa. A7	173
S.Chicago,Ill. R2	175
SparrowsPt.,Md. B2	175
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	179

(To Wholesalers; per cwt)

Galveston,Tex. D7 .... $9.10

NAILS, Cut (100 lb keg)
To Dealers (33)

Conshohocken,Pa. A3	..$9.80
Wheeling,W.Va. W10	...9.80

POLISHED STAPLES

	Col.
AlabamaCity,Ala. R2	...175
Aliquippa,Pa. J5	175
Atlanta A11	177
Bartonville,Ill. K4	177
Crawfordsville,Ind. M8	..177
Donora,Pa. A7	175
Duluth A7	175
Fairfield,Ala. T2	175
Jacksonville,Fla.(20) M8	.186
Johnstown,Pa. B2	175
Joliet,Ill. A7	175
Kokomo,Ind. C16	177
Minnequa,Colo. C10	180
Pittsburg,Calif. C11	194
Rankin,Pa. A7	175
S.Chicago,Ill. R2	175
SparrowsPt.,Md. B2	177
Sterling,Ill.(7) N15	175
Worcester,Mass. A7	181

TIE WIRE, Automatic Baler (14½ Ga.)(Per 97 lb Net Box)
Coil No. 3150

AlabamaCity,Ala. R2	.$10.26
Atlanta A11	....10.36
Bartonville,Ill. K4	....10.36
Buffalo W12	....10.26
Chicago W13	....10.26
Crawfordsville,Ind. M8	.10.36
Donora,Pa. A7	....10.26
Duluth A7	....10.26
Fairfield,Ala. T2	....10.26
Houston S5	....10.51
Jacksonville,Fla. M8	..10.82
Johnstown,Pa. B2	....10.26
Joliet,Ill. A7	....10.26
KansasCity,Mo. S5	....10.51
Kokomo,Ind. C16	....10.36
LosAngeles B3	....11.05
Minnequa,Colo. C10	...10.51
Pittsburg,Calif. C11	...11.04
S.Chicago,Ill. R2	....10.26
S.SanFrancisco C10	...11.04
SparrowsPt.,Md. B2	..10.36
Sterling,Ill(37) N15	..10.36

Coil No. 6500 Stand.

AlabamaCity,Ala. R2	..$10.60
Atlanta A11	....10.70
Bartonville,Ill. K4	....10.70
Buffalo W12	....10.60
Chicago W13	....10.60
Crawfordsville,Ind. M8	.10.70
Donora,Pa. A7	....10.60
Duluth A7	....10.60
Fairfield,Ala. T2	....10.60
Houston S5	....10.85
Jacksonville,Fla. M8	..11.16
Johnstown,Pa. B2	....10.60
Joliet,Ill. A7	....10.60
KansasCity,Mo. S5	....10.85
Kokomo,Ind. C16	....10.70
LosAngeles B3	....11.40
Minnequa,Colo. C10	...10.85
Pittsburg,Calif. C11	...11.40
S.Chicago,Ill. R2	....10.60
S.SanFrancisco C10	...11.40
SparrowsPt.,Md. B2	...10.70
Sterling,Ill.(37) N15	...10.70

Coil No. 6500 Interim

AlabamaCity,Ala. R2	..$10.65
Atlanta A11	....10.75
Bartonville,Ill. K4	....10.75
Buffalo W12	....10.65
Chicago W13	....10.65
Crawfordsville,Ind. M8	.10.75
Donora,Pa. A7	....10.65
Duluth A7	....10.65
Fairfield,Ala. T2	....10.65
Houston S5	....10.90
Jacksonville,Fla. M8	..11.21
Johnstown,Pa. B2	....10.65
Joliet,Ill. A7	....10.65
KansasCity,Mo. S5	....10.90
Kokomo,Ind. C16	....10.75
LosAngeles B3	....11.45
Minnequa,Colo. C10	...10.90
Pittsburg,Calif. C11	...11.45
S.Chicago,Ill. R2	....10.65
S.SanFrancisco C10	...11.45
SparrowsPt.,Md. B2	...10.75
Sterling,Ill.(37) N15	...10.75

BALE TIES, Single Loop

	Col.
AlabamaCity,Ala. R2	...212
Atlanta A11	214
Bartonville,Ill. K4	214
Crawfordsville,Ind. M8	..214
Donora,Pa. A7	212
Duluth A7	212
Fairfield,Ala. T2	212
Houston S5	217
Jacksonville,Fla. M8	219
Joliet,Ill. A7	212
KansasCity,Mo. S5	217
Kokomo,Ind. C16	214
Minnequa,Colo. C10	217
Pittsburg,Calif. C11	...236
S.SanFrancisco C10	236
SparrowsPt.,Md. B2	214
Sterling,Ill.(7) N15	214
Williamsport,Pa. S19	175

FENCE POSTS

Birmingham C15	171
ChicagoHts.,Ill. C2, I-2	..172
Duluth A7	172
Franklin,Pa. F5	172
Huntington,W.Va. C15	...171
Johnstown,Pa. B2	172
Marion,O. P11	172
Minnequa,Colo. C10	177
Sterling,Ill.(1) N15	172
Tonawanda,N.Y. B12	...174

WIRE, Barbed

	Col.
AlabamaCity,Ala. R2	..193**
Aliquippa, Pa. J5	....190§
Atlanta A11	....198*
Bartonville,Ill. K4	198
Crawfordsville,Ind. M8	..198
Donora,Pa. A7	....193†
Duluth A7	....193†
Fairfield,Ala. T2	....193†
Houston,Tex. S5	....198**
Jacksonville,Fla. M8	203
Johnstown,Pa. B2	....196§
Joliet,Ill. A7	....193†
KansasCity,Mo. S5	....198**
Kokomo,Ind. C16	....195†
Minnequa,Colo. C10	...198**
Monessen,Pa. P7	....196*
Pittsburg,Calif. C11	...213†
Rankin,Pa. A7	....193†
S.Chicago,Ill. R2	....193**
S.SanFrancisco C10	...213**
SparrowsPoint,Md. B2	..198§
Sterling,Ill.(7) N15	....198§

WOVEN FENCE, 9-15 Ga.

	Col.
Ala.City,Ala. R2	....187**
Aliq'ppa,Pa.9-14¼ga.J5	190§
Atlanta A11	....192*
Bartonville,Ill. K4	192
Crawfordsville,Ind. M8	..192
Donora,Pa. A7	....187†
Duluth A7	....187†
Fairfield,Ala. T2	....187†
Houston,Tex. S5	....192**
Jacksonville,Fla. M8	197
Johnstown,Pa.(43) B2	..190§
Joliet,Ill. A7	....187†
KansasCity,Mo. S5	....192**
Kokomo,Ind. C16	....189†
Minnequa,Colo. C10	...192**
Pittsburg,Calif. C11	...210†
Rankin,Pa. A7	....187†
S.Chicago,Ill. R2	....187**
Sterling,Ill.(7) N15	....192§

WIRE (16 gage)	An'ld Stone	Galv. Stone
Ala.City,Ala.R2	17.15	18.70**
Aliq'ppa,Pa. J5	17.15	18.95
Bartonville K4	..17.25	19.05
Cleveland A7	...17.15	....
Crawf'dsville M8	17.25	19.05
Fostoria,O. S1	..17.65	19.20†
Houston S5	....17.40	18.95**
Jacksonville M8	17.50	19.30
Johnstown B2	..17.15	18.95§
Kan.City,Mo. S5	17.40	....
Kokomo C16	...17.25	18.80†
Minnequa C10	..17.40	18.95**
P'im'r,Mass. W12	17.45	19.00†
Pitts.,Calif. C11	17.50	19.05†
SparrowsPt. B2	..17.25	19.05§
Sterling(37) N15	17.25	19.05§
Waukegan A7	...17.15	18.70†
Worcester A7	...17.45	....

WIRE, Merchant Quality

(6 to 8 gage)	An'ld	Galv.
Ala.City,Ala. R2	..8.65	9.20**
Aliquippa J5	....8.65	9.325§
Atlanta(48) A11	..8.75	9.425*
Bartonville(48) K4	8.75	9.425
Buffalo W12	.....8.65	9.20†
Cleveland A7	.....8.65	....
Crawfordsville M8	8.75	9.425
Donora,Pa. A7	...8.65	9.20†
Duluth A7	.....8.65	9.20†
Fairfield T2	.....8.65	9.20†
Houston(48) S5	..8.90	9.45**
Jacks'ville,Fla. M8	9.00	9.675
Johnstown B2(48)	8.65	9.325§
Joliet,Ill. A7	.....8.65	9.20†
Kans.City(48) S5	8.90	9.45**
Kokomo C16	.....8.75	9.30†
LosAngeles B3	..9.60	10.275§
Minnequa C10	...8.90	9.45**
Monessen P7(48)	..8.65	9.25*
Palmer,Mass. W12	8.95	9.50†
Pitts.,Calif. C11	..9.60	10.15†
Rankin,Pa. A7	...8.65	9.20†
S.Chicago R2	....8.65	9.20**
S.SanFran. C10	..9.60	10.15**
Spar'wsPt.B2(48)	8.75	9.425§
Sterling(48) N15	..8.90	9.575§
Sterling(1)(48)	...8.80	9.475§
Struth'rs,O.(48)	Y1 8.65	9.30†
Worcester,Mass.	A7 8.95	9.50†

Based on zinc price of: *13.50c. †5c. §10c. ‡Less than 10c. ††10.50c. **Subject to zinc equalization extras.

FASTENERS

(Base discounts, full container quantity, per cent off list, f.o.b. mill)

BOLTS

Carriage, Machine Bolts
Full Size Body (cut thread)

½ in. and smaller:	
6 in. and shorter....	49.0
Longer than 6 in. ..	39.0
⅝ in. thru 1 in.:	
6 in. and shorter....	39.0
Longer than 6 in. ..	35.0
1⅛ in. and larger:	
All lengths	35.0

Undersized Body (rolled thread)

½ in. and smaller:	
6 in. and shorter...	49.0

Carriage, Machine, Lag Bolts
Hot Galvanized:

½ in. and smaller:	
6 in. and shorter...	29.0
Longer than 6 in. ..	15.0
⅝ in. and larger:	
All lengths	12.0

Lag Bolts (all diam.)

6 in. and shorter...	49.0
Longer than 6 in. ..	39.0

Plow and Tap Bolts

½ in. and smaller by 6 in. and shorter	49.0
Larger than ½ in. or longer than 6 in. ..	39.0

Blank Bolts 39.0
Step, Elevator, Tire Bolts 49.0

Stove Bolts, Slotted:

⅛ to ¼-in. incl., 3 in. and shorter..	55.0
⅛ to ½ in., inclusive	55.0

NUTS

Reg. & Heavy Square Nuts:
All sizes 55.5
Square Nuts, Reg. &
Heavy, Hot Galvanized:
All sizes 41.0
Hex Nuts, Reg. &
Heavy, Hot Pressed:

¾ in. and smaller..	60.5
⅞ in. to 1 in., incl.	55.5
1⅛ in. to 1½ in., incl.	58.5
1⅝ in. and larger..	53.5

Hex Nuts, Reg. &
Heavy, Cold Punched:

¾ in. and smaller..	60.5
⅞ in. to 1½ in., incl.	55.5
1⅝ in. and larger..	53.5

Hex Nuts, All Types,
Hot Galvanized:

¾ in. and smaller..	46.5
⅞ in. to 1 in., incl..	41.5
1⅛ in. to 1½ in., incl.	46.5

Hex Nuts, Semifinished, Heavy (Incl. Slotted):

¾ in. and smaller..	60.5
⅞ in. to 1⅛ in., incl.	55.5
1⅝ in. and larger..	53.5

Hex Nuts, Finished (Incl. Slotted and Castellated):

1 in. and smaller..	63.0
1⅛ in. to 1⅝ in., incl.	59.0
1⅝ in. and larger..	53.5

Semifinished Hex Nuts, Reg. (Incl. Slotted):

⅝ in. and smaller..	60.5
¾ in. to 1 in., incl.	63.0
1⅛ in. to 1½ in., incl.	59.0
1⅝ in. and larger..	53.5

CAP AND SETSCREWS
(Base discounts, packages, per cent off list, f.o.b. mill)

Hex Head Capscrews, Coarse or Fine Thread, Bright:

6 in. and shorter:	
⅝ in. and smaller..	40.0
¾, ⅞, and 1 in. diam.	22.0
Longer than 6 in.:	
⅝ in. and smaller..	8.0
¾, ⅞, and 1 in. diam.	+6.0

High Carbon, Heat Treated:

6 in. and shorter:	
⅝ in. and smaller..	26.0
¾, ⅞, and 1 in. diam.	3.0
Longer than 6 in.:	
⅝ in. and smaller..+13.0	
¾, ⅞, and 1 in. diam. .....+32.0	

Flat Head Capscrews:
¼ in. and smaller..+76.0
Setscrews, Square Head, Cup Point, Coarse Thread:
Through 1 in. diam.:
6 in. and shorter... Net
Longer than 6 in...+23

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago and/or freight equalized with Birmingham except where equalization is too great.
Structural ½ in., larger 12.25
⅞ in. under: List less 19%

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	25.98	23.54
1¼	13	....	30.78	23.36
1½	13	29.03	34.01	25.83
1¾	13	34.29	40.18	30.51
2	13	38.44	45.05	34.20
2¼	13	43.29	50.75	38.52
2½	12	46.99	55.06	41.81
2½	12	51.76	60.65	46.05
2¾	12	56.04	65.67	49.88
3	12	59.76	70.03	53.19

RAILWAY MATERIALS

	Standard No. 1	Standard No. 2	Tee Rails All	Tee Rails 60 lb Under
RAILS				
Bessemer,Pa. U5	5.525	5.425	....	6.50
Ensley,Ala. T2	5.525	5.425	....	6.50
Fairfield,Ala. T2	....	....	....	6.50
Gary,Ind. U5	5.525	5.425	....	....
Huntington,W.Va. C15	....	....	....	6.50
IndianaHarbor,Ind. I-2	5.525	5.425	5.475	....
Johnstown,Pa. B2	....	....	...(16)	6.50
Lackawanna,N.Y. B2	5.525	5.425	....	6.50
Minnequa,Colo. C10	5.525	5.425	....	7.00
Steelton,Pa. B2	5.525	5.425	....	....
Williamsport,Pa. S19	....	....	....	6.50

TIE PLATES

Fairfield,Ala. T2	.....6.60
Gary,Ind. U5	.....6.60
Ind.Harbor,Ind. I-2	....6.60
Lackawanna,N.Y. B2	...6.60
Minnequa,Colo. C10	....6.60
Seattle B3	.....6.75
Steelton,Pa. B2	.....6.60
Torrance,Calif. C11	....6.75

JOINT BARS

Bessemer,Pa. U5	.....6.975
Fairfield,Ala. T2	.....6.975
Ind.Harbor,Ind. I-2	....6.975
Joliet,Ill. U5	.....6.975
Lackawanna,N.Y. B2	..6.975
Minnequa,Colo. C10	...6.975
Steelton,Pa. B2	.....6.975

AXLES

Ind.Harbor,Ind. S13	...8.775
Johnstown,Pa. B2	....8.775

TRACK BOLTS, Untreated

Cleveland R2	.....14.75
KansasCity,Mo. S5	....14.75
Lebanon,Pa. B2	.....14.75
Minnequa,Colo. C10	...14.75
Pittsburgh P14	.....14.75
Seattle B3	.....15.25

SCREW SPIKES

Lebanon,Pa. B2	.....14.50

STANDARD TRACK SPIKES

Fairfield,Ala. T2	.....9.75
Ind.Harbor,Ind. I-2, Y1	9.75
KansasCity,Mo. S5	....9.75
Lebanon,Pa. B2	.....9.75
Minnequa,Colo. C10	....9.75
Pittsburgh J5	.....9.75
Seattle B3	.....10.25
S.Chicago,Ill. R2	.....9.75
Struthers,O. Y1	.....9.75
Youngstown R2	.....9.75

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1⅛ to under 1 7/16 in.; 1 7/16 to under 1 15/16 in., 6.70c; 1 15/16 to 8 in., inclusive, 7.05c.
(6) Chicago or Birm. base.
(7) Chicago base 2 cols. lower.
(8) 13 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ¾" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(20) Plus 1c per 100 lb.
(21) New Haven, Conn. base.
(22) Deld. San Francisco Bay area.
(23) Special quality.
(24) Deduct 0.15c, finer than 15 Ga.
(25) Bar mill bands.
(26) Delivered in mill zone, 6.045c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝ in.; 7.60c, for widths ⅝ in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(37) Chicago base, 10 points lower.
(38) 14 Ga. & lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.685c.
(43) 9-14½ Ga.
(44) To fabricators.
(45) 0.022 in. and lighter, over 0.022", 8.20c.
(46) Special quality.
(48) 6-7 Ga.
(49) 3½ in. and smaller rounds; 9.30c, over 3½ in. and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	+9.25	+24.25	+2.75	+19.5	+0.25	+17	1.25	+15.5	1.25	+15.5	1	+15.75	3.5	+13.25
Ambridge, Pa. N2	+9.25	....	+2.75	....	+0.25	....	1.25	....	1.25	....	1	....	3.5	....
Lorain, O. N3	+9.25	+24.25	+2.75	+19.5	+0.25	+17	1.25	+15.5	1.25	+15.5	1	+15.75	3.5	+13.25
Youngstown Y1	+9.25	+24.25	+2.75	+19.5	+0.25	+17	1.25	+15.5	1.25	+15.5	1	+15.75	3.5	+13.25

ELECTRIC STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	+9.25	+24.25	+2.75	+19.5	+0.25	+17	1.25	+15.5	1.25	+15.5	1	+15.75	3.5	+13.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	5.25	+10	8.25	+6	11.75	+1.5	14.25	+0.75
Alton, Ill. L1	....	....	....	....	....	....	3.25	+12	6.25	+8	9.75	+3.5	12.25	+2.75
Benwood, W. Va. W10	4.5	+22	+7.5	+31	+18	+39.5	5.25	+10	8.25	+6	11.75	+1.5	14.25	+0.75
Butler, Pa. F6	5.5	+21	+6.5	+30	+17	+38.5	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	5.25	+10	8.25	+6	11.75	+1.5	14.25	+0.75
Fairless, Pa. N3	....	....	....	....	....	....	3.25	+12	6.25	+8	9.75	+3.5	12.25	+2.75
Fontana, Calif. K1	....	....	....	....	....	....	+8.25	+23.5	+5.25	+19.5	+1.75	+15	0.75	+14.25
Indiana Harbor, Ind. Y1	....	....	....	....	....	....	4.25	+11	7.25	+7	10.75	+2.5	13.25	+3.25
Lorain, O. N3	....	....	....	....	....	....	5.25	+10	8.25	+6	11.75	+1.5	14.25	+0.75
Sharon, Pa. S4	5.5	+21	+6.5	+30	+17	+38.5	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	5.25	+10	8.25	+6	11.75	+1.5	14.25	+0.75
Sparrows Pt., Md. B2	3.5	+23	8.5	+32	+19	+40.5	3.25	+12	6.25	+8	9.75	+3.5	12.25	+2.75
Wheatland, Pa. W9	5.5	+21	+6	+30	+17	+38.5	5.25	+10	8.25	+6	11.75	+1.5	14.25	+0.75
Youngstown R2, Y1	....	....	....	....	....	....	5.25	+10	8.25	+6	11.75	+1.5	14.25	+0.75

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.73		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	14.75	0.25	15.25	0.75	16.75	0.5	16.75	0.5	....	....	....	....
Alton, Ill. L1	12.75	+1.75	13.25	+1.25	14.75	+1.5	14.75	+1.5	....	....	....	....
Benwood, W. Va. W10	14.75	0.25	15.25	0.75	16.75	0.5	16.75	0.5	6.25	+10.5	6.25	+10.5
Etna, Pa. N2	14.75	0.25	15.25	0.75	16.75	0.5	16.75	0.5	6.25	+10.5	6.25	+10.5
Fairless, Pa. N3	12.75	+1.75	13.25	+1.25	14.75	+1.5	14.75	+1.5	4.25	+12.5	4.25	+12.5
Fontana, Calif. K1	1.25	+13.25	1.75	+12.75	3.25	+13	3.25	+13	+7.25	+24	+7.25	+24
Indiana Harbor, Ind. Y1	13.75	+0.75	14.25	+0.25	15.75	+0.5	15.25	+0.5	5.25	+11.5	5.25	+11.5
Lorain, O. N3	14.75	0.25	15.25	0.75	16.75	0.5	16.75	0.5	....	....	....	....
Sharon, Pa. M6	14.75	0.25	15.25	0.75	16.75	0.5	16.75	0.5	....	....	....	....
Sparrows Pt., Md. B2	12.75	+1.75	13.25	+1.25	14.75	+1.5	14.75	+1.5	4.25	+12.5	4.25	+12.5
Wheatland, Pa. W9	14.75	0.25	15.25	0.75	16.75	0.5	16.75	0.5	6.25	+10.5	6.25	+10.5
Youngstown R2, Y1	14.75	0.25	15.25	0.75	16.75	0.5	16.75	0.5	6.25	+10.5	6.25	+10.5

*Galvanized pipe discounts based on current price of zinc (10.00c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	—Rerolling— Ingot	Slabs	Forging Billets	H.R. Strip	Wire Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	22.00	27.00	....	36.00	....	42.00	44.25	48.50	45.00
202	23.75	30.25	36.50	39.00	40.75	43.00	45.00	49.25	49.25
301	23.25	28.00	37.25	37.25	42.00	44.25	46.25	51.25	47.50
302	25.25	31.50	38.00	40.50	42.75	45.00	47.25	52.00	52.00
302B	25.50	32.75	40.75	45.75	45.00	47.25	49.50	57.00	57.00
303	....	32.00	41.00	....	45.50	48.00	50.00	56.75	56.75
304	27.00	33.25	40.50	44.25	45.25	47.75	50.75	55.50	55.50
304L	....	....	48.25	51.50	53.00	55.50	58.50	63.25	63.25
305	28.50	36.75	42.50	47.50	45.25	47.75	51.25	58.75	58.75
308	30.75	38.25	47.25	50.25	52.75	55.75	60.25	63.00	63.00
309	39.75	49.50	57.75	64.50	63.75	67.00	71.00	80.50	80.50
310	49.75	61.50	78.00	84.25	86.50	91.00	92.75	96.75	96.75
314	....	....	....	....	86.50	....	92.75	....	104.50
316	39.75	49.50	62.25	69.25	69.25	73.00	76.75	81.50	81.50
316L	....	....	70.00	76.50	77.00	80.75	84.50	89.25	89.25
317	48.00	60.00	76.75	88.25	86.25	90.75	93.50	101.00	101.00
321	32.25	40.00	47.00	53.50	52.50	55.50	59.75	65.50	65.50
330	....	....	106.75	....	106.75	106.75	105.50	108.00	149.25
18-8 CbTa	37.00	46.50	55.75	63.50	61.50	64.75	69.75	79.25	79.25
403	....	....	32.00	....	35.75	37.75	40.25	48.25	48.25
405	19.50	25.50	29.75	36.00	33.50	35.25	37.50	46.75	46.75
410	16.75	21.50	28.25	31.00	32.00	33.75	35.00	40.25	40.25
416	....	....	28.75	....	32.50	34.25	36.25	48.25	48.25
420	....	33.50	34.25	41.75	39.25	41.25	45.25	62.00	62.00
430	17.00	21.75	28.75	32.00	32.50	34.25	36.00	40.75	40.75
430F	....	....	29.50	....	33.00	34.75	36.75	51.75	51.75
431	....	28.75	37.75	....	42.00	44.25	46.00	56.00	56.00
446	....	....	39.25	59.00	44.25	46.50	47.75	70.00	70.00

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; Alloy Metal Wire Div., H. K. Porter Co. Inc.; Alloy Tube Div., Carpenter Steel Co.; American Steel & Wire Div., U. S. Steel Corp.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; A. M. Byers Co.; G. O. Carlson Inc.; Charter Wire Products Co.; Crucible Steel Co. of America; Damascus Tube Co.; Dearborn Div., Sharon Steel Corp.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Elwood Ivins Steel Tube Works Inc.; Firth Sterling Inc.; Ft. Wayne Metals Inc.; Globe Steel Tubes Co.; Helical Tube Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Jones & Laughlin Steel Corp.; Joslyn Mfg. & Supply Co.; Kenmore Metals Corp.; Maryland Fine & Specialty Wire Co.; McInnes Steel Co.; McLouth Steel Corp.; Metal Forming Corp.; National-Standard Co.; National Tube Div., U. S. Steel Corp.; Newman-Crosby Steel Co.; Pacific Tube Co.; Page Steel & Wire Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Rodney Metals Inc.; Rome Mfg. Co.; Sawhill Tubular Products Inc.; Sharon Steel Corp.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Spencer Wire Corp.; Stainless Welded Products Inc.; Standard Tube Co.; Stainless Steel Div., Jones & Laughlin Steel Corp.; Superior Steel Corp.; Superior Tube Co.; Techalloy Co. Inc.; Timken Roller Bearing Co.; Trent Tube Co.; Tube Methods Inc.; Uibrich Stainless Steels; United States Steel Corp.; Universal-Cyclops Steel Co.; Wallingford Steel Co.; Washington Steel Corp.

Clad Steel

Stainless	Plates—Carbon Base 5%	10%	15%	20%	Sheets—Carbon Base 20%
302	....	....	....	....	37.50
304	34.70	37.95	42.25	46.70	40.00
304L	36.90	40.55	45.10	49.85	....
316	40.35	44.40	49.50	54.50	58.75
316L	45.05	49.35	54.70	60.10	....
316 Cb	47.30	53.80	61.45	69.10	....
321	36.60	40.05	44.60	49.30	47.25
347	38.25	42.40	47.55	52.80	57.00
405	28.60	29.85	33.35	36.85	....
410	28.15	29.55	33.10	36.70	....
430	28.30	29.80	33.55	37.25	....
Inconel	48.90	59.55	70.15	80.85	....
Nickel	41.65	51.95	62.30	72.70	....
Nickel, Low Carbon	41.95	52.60	63.30	74.15	....
Monel	43.35	53.55	63.80	74.05	....
Copper*	....	....	....	....	48.00

	Strip, Carbon Base—Cold Rolled— 10%	Both Sides
Copper*	33.95	40.25

*Deoxidized. Production points: Stainless-clad sheets, New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4, and Washington, Pa. J3; nickel, inconel, monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Tool Steel

Grade	$ per lb	Grade	$ per lb
Regular Carbon	0.305	Cr Hot Work	0.510
Extra Carbon	0.360	W-Cr Hot Work	0.500
Special Carbon	0.475	V-Cr Hot Work	0.475
Oil Hardening	0.475	Hi-Carbon-Cr	0.830

Grade by Analysis (%) W	Cr	V	Co	Mo	$ per lb
20.25	4.25	1.6	12.25	....	4.285
18.25	4.25	1	4.75	....	2.500
18	4	2	9	....	2.870
18	4	2	....	....	1.960
18	4	1	....	....	1.795
9	3.5	..	....	....	1.395
13.5	4	3	....	....	2.060
13.75	3.75	2	5	....	2.440
6.4	4.5	1.9	....	5	1.300
6	4	3	....	6	1.545
1.5	4	1	....	8.5	1.155

Tool steel producers include: A4, A8, B2, B8, C4, C9, C13, C18, F2, J3, L3, M14, S8, U4, V2, and V3.

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate and do not include 3% federal transportation tax.

	Basic	No. 2 Foundry	Malleable	Bessemer
Birmingham District				
AlabamaCity,Ala. R2	62.00	62.50	....	....
Birmingham R2	62.00	62.50‡	....	....
Birmingham U6	....	62.50‡	66.50	....
Woodward,Ala. W15	62.00**	62.50‡	66.50	....
Cincinnati, deld.	....	70.20	....	....
Buffalo District				
Buffalo H1, R2	66.00	66.50	67.00	67.50
N.Tonawanda,N.Y. T9	....	66.50	67.00	67.50
Tonawanda,N.Y. W12	66.00	66.50	67.00	67.50
Boston, deld.	77.29	77.79	78.29	....
Rochester,N.Y., deld.	69.02	69.52	70.02	....
Syracuse,N.Y., deld.	70.12	70.62	71.12	....
Chicago District				
Chicago I-3	66.00	66.50	66.50	67.00
S.Chicago,Ill. R2	66.00	....	66.50	....
S.Chicago,Ill. W14	66.00	....	66.50	67.00
Milwaukee, deld.	68.62	69.12	69.12	69.62
Muskegon,Mich., deld.	....	74.12	74.12	....
Cleveland District				
Cleveland R2, A7	66.00	66.50	66.50	67.00
Akron,O., deld.	69.12	69.62	69.62	70.12
Mid-Atlantic District				
Birdsboro,Pa. B10	68.00	68.50	69.00	69.50
Chester,Pa. P4	66.50	67.00	67.50	....
Swedeland,Pa. A3	68.00	68.50	69.00	69.50
New York, deld.	....	75.10	75.60	....
Newark,N.J., deld.	72.29	72.79	73.29	73.79
Philadelphia, deld.	70.01	70.51	71.01	71.59
Troy,N.Y. R2	68.00	68.50	69.00	69.50
Pittsburgh District				
NevilleIsland,Pa. P6	66.00	66.50	66.50	67.00
Pittsburgh (N&S sides), Aliquippa, deld.	....	67.95	67.95	68.48
McKeesRocks,Pa., deld.	....	67.60	67.60	68.13
Lawrenceville,Homestead, Wilmerding,Monaca,Pa., deld.	....	68.26	68.26	68.79
Verona,Trafford,Pa., deld.	68.29	68.82	68.82	69.35
Brackenridge,Pa., deld.	68.60	69.10	69.10	69.63
Midland,Pa. C18	66.00	....	....	....

	Basic	No. 2 Foundry	Malleable	Bessemer
Youngstown District				
Hubbard,O. Y1	....	....	66.50	....
Sharpsville,Pa. S6	66.00	....	66.50	67.00
Youngstown Y1	....	....	66.50	67.00
Mansfield,O., deld.	70.90	....	71.40	71.90
Duluth I-3	66.00	66.50	66.50	67.00
Erie,Pa. I-3	66.00	66.50	66.50	67.00
Everett,Mass. E1	67.50	68.00	68.50	....
Fontana,Calif. K1	75.00	75.50	....	....
Geneva,Utah C11	66.00	66.50	....	....
GraniteCity,Ill. G4	67.90	68.40	68.90	....
Ironton,Utah C11	66.00	66.50	....	....
Minnequa,Colo. C10	68.00	68.50	69.00	....
Rockwood,Tenn. T3	....	62.50‡	66.50	....
Toledo,O. I-3	66.00	66.50	66.50	67.00
Cincinnati, deld.	72.54	73.04	....	....

**Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.
‡Phos. 0.70-0.90%; Phos. 0.30-0.69%, $63.50.

PIG IRON DIFFERENTIALS

Silicon: Add 75 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos. iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.25% manganese over 1% or portion thereof.

Nickel: Under 0.50% no extra; 0.50-0.74%, inclusive, add $2 per ton and each additional 0.25%, add $1 per ton.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1 for each 0.50% silicon or portion thereof over the base grade within a range of 6.50 to 11.50%; starting with silicon over 11.50% add $1.50 per ton for each 0.50% silicon or portion thereof up to 14%; add $1 for each 0.50% Mn over 1%)

Jackson,O. I-3, J1	78.00
Buffalo H1	79.25

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1.25 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

CalvertCity,Ky. P15	$99.00
NiagaraFalls,N.Y. P15	99.00
Keokuk,Iowa Open-hearth & Fdry, $9 freight allowed K2	103.50
Keokuk,Iowa O.H. & Fdry, 12½ lb piglets, 16% Si, max fr'gt allowed up to $9, K2	106.50

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$78.50
Troy,N.Y. R2 (Phos. 0.035% max)	74.00
Philadelphia, deld.	82.27
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	71.00
NevilleIsland,Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	71.00

Warehouse Steel Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, Spokane, San Francisco, 10 cents; Atlanta, Chattanooga, Houston, Seattle no charge.

	SHEETS				STRIP	BARS			Standard Structural Shapes	PLATES	
	Hot-Rolled	Cold-Rolled	Gal. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Rounds	C.F. Rds.‡	H.R. Alloy 4140††[5]		Carbon	Floor
Atlanta	8.59§	9.86§	....	....	8.64	9.01	10.68	....	9.05	8.97	10.90
Baltimore	8.28	8.88	9.76	....	8.76	9.06	11.34 #	15.18	9.19	8.66	10.14
Birmingham	8.18	9.45	11.07	....	8.23	8.60	10.57	....	8.64	8.56	10.70
Boston	9.38	10.44	11.45	....	9.42	9.73	12.90 #	15.28	9.63	9.72	11.20
Buffalo	8.40	9.00	10.07	....	8.50	8.80	10.90 #	15.00	8.90	8.90	10.45
Chattanooga	8.35	9.69	9.65	....	8.40	8.77	10.46	....	8.88	8.80	10.66
Chicago	8.20	9.45	10.00	....	8.23	8.60	8.80	14.65	8.64	8.56	9.88
Cincinnati	8.34	9.48	10.05	....	8.54	8.92	9.31	14.96	9.18	8.93	10.21
Cleveland	8.18	9.45	9.95	....	8.33	8.69	10.80 #	14.74	9.01	8.79	10.11
Denver	9.38	11.75	....	....	9.41	9.78	11.10	....	9.82	9.74	11.06
Detroit	8.43	9.70	10.35	....	8.58	8.90	9.15	14.91	9.18	8.91	10.13
Erie, Pa.	8.20	9.45	9.95[10]	....	8.50	8.75	9.05[10]	....	9.00	8.85	10.10
Houston	8.45	9.75	8.45	....	8.60	9.05	11.10	....	9.10	9.05	10.30
Jackson, Miss.	8.52	9.79	....	....	8.57	8.94	10.68	....	8.97	8.90	10.74
Los Angeles	9.50	10.75	11.65	....	9.55	9.55	12.75	16.00	9.60	9.55	11.70
Milwaukee	8.33	9.58	10.13	....	8.36	8.73	9.03	14.78	8.85	8.69	10.01
Moline, Ill.	8.55	9.80	10.35	....	8.58	8.95	9.15	....	8.99	8.91	....
New York	8.87	10.13	10.56	....	9.31	9.57	12.76 #	15.09	9.35	9.43	10.71
Norfolk, Va.	8.05	....	....	....	8.55	8.60	10.80	....	8.95	8.45	9.95
Philadelphia	8.00	8.90	9.87	51.94	8.69	8.65	11.51 #	15.01	8.50	8.77	9.77**
Pittsburgh	8.18	9.45	10.35	50.00	8.33	8.60	10.80 #	14.65	8.64	8.56	9.88
Portland, Oreg.	8.50	11.20	11.55	57.20	11.35‡‡	8.65	14.65 #	15.95	9.60	8.30	12.50
Richmond, Va.	8.45	....	10.40	....	9.15	9.15	....	....	9.40	8.85	10.35
St. Louis	8.54	9.79	10.36	....	8.59	8.97	9.41	15.01	9.10	8.93	10.25
St. Paul	8.79	10.04	10.61	....	8.84	9.36	9.66	....	9.38	9.30	10.49
San Francisco	9.35	10.75	11.00	54.85	9.45	9.70	13.00	16.00	9.50	9.60	12.00
Seattle	9.95	11.15	12.00	57.20	10.00	10.80	14.05	16.35	9.80	9.70	12.10
Spokane, Wash.	9.95	11.15	12.00	....	10.00	10.10	14.05	17.20	9.80	9.70	12.10
Washington	8.48	9.58	....	....	9.06	9.15	9.73	....	9.35	8.86	10.36

*Prices do not include gage extras; †prices include gage and coating extras; ‡includes 35-cent bar quality extras; §42 in. and under; **⅛ in. and heavier; ††as annealed; ‡‡over 4 in.; §§over 3 in.; #1 in. round C-1018.

Base quantities, 2000 to 4999 lb except as noted; cold-rolled strip and cold-finished bars, 2000 lb and over except in Seattle, 2000 to 9999 lb, and in Los Angeles, 6000 lb and over; stainless sheets, 8000 lb except in Chicago, New York, Boston, Seattle, Portland, Oreg. 10,000 lb and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb, except in Portland, Oreg., 1000 to 9999 lb; [3]—400 to 9999 lb; [5]—1000 to 1999 lb; [8]—2000 to 3999 lb; [10]—2000 lb and over.

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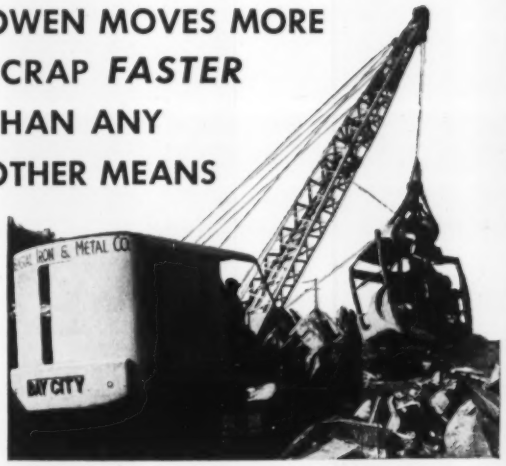

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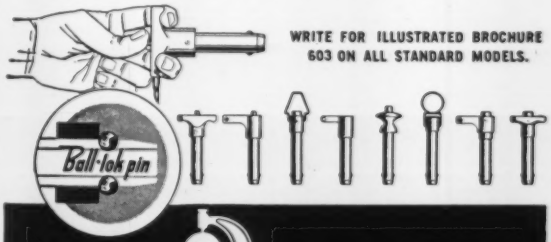

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Refractories

Fire Clay Brick (per 1000)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parral, Portsmouth, O., Ottawa, Ill., Stevens Pottery, Ga., $135; Salina, Pa., $140; Niles, O., $138; Cutler, Utah, $165.

Super-Duty: Ironton, O., Vandalia, Mo., Olive Hill, Ky., Clearfield, Salina, Pa., New Savage, Md., St., Louis, $175; Stevens Pottery, Ga., $185; Cutler, Utah, $233.

Silica Brick (per 1000)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Pt. Matilda, Pa., Portsmouth, O., Hawstone, Pa., $150; Warren, Niles, Windham, O., Hays, Latrobe, Morrisville, Pa., $155; E. Chicago, Ind., Joliet, Rockdale, Ill., $160; Lehigh, Utah, $175; Los Angeles, $180.

Super-Duty: Sproul, Hawstone, Pa., Niles, Warren, Windham, O., Leslie, Md., Athens, Tex., $157; Morrisville, Hays, Latrobe, Pa., $160; E. Chicago, Ind., $167; Curtner, Calif., $182.

Silica Brick (per 1000)

Clearfield, Pa., $140; Philadelphia, $137; Woodbridge, N. J., $135.

Ladle Brick (per 1000)

Dry Pressed: Aisey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Vanport, Pa., Mexico, Vandalia, Mo., Wellsville, Irondale, New Salisbury, O., $96.75; Clearfield, Pa., Portsmouth, O., $102.

High-Alumina Brick (per 1000)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $235; Danville, Ill., $238; Philadelphia, Clearfield, Pa., $230; Orviston, Pa., $245.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $295; Danville, Ill., $298; Philadelphia, Clearfield, Orviston, Pa., $305.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $335; Danville, Ill., $338; Philadelphia, Clearfield, Orviston, Pa., $345.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St. Louis, $188.

Nozzles (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., St. Louis, $310.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $234.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., Bettsville, Millersville, Martin, Woodville, Gibsonburg, Narlo, O., $16.75; Thornton, McCook, Ill., $17; Dolly Siding, Bonne Terre, Mo., $15.

Magnesite (per net ton)

Domestic, dead-burned, bulk ½ in. grains with fines: Chewelah, Wash., Luning, Nev., $46; ⅜ in. grains with fines: Baltimore, $73.

Fluorspar

Metallurgical grades, f.o.b. shipping point, in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $37-41; 70%, $36.40; 60%, $33-36.50. Imported, net tons, f.o.b. cars point of entry duty paid, metallurgical grade: European, $33-34; Mexican, all-rail, duty paid, $25.25-25.75; barge, Brownsville, Tex., $27.25-27.75.

Metal Powder

(Per pound f.o.b. shipping point in ton lots for minus 100 mesh, except as noted)

	Cents
Sponge Iron, Swedish: Deld. east of Mississippi River, ocean bags 23,000 lb and over.. F.o.b. Riverton or Camden, N. J., west of Mississippi River.	10.50 9.50
Sponge Iron, Domestic, 98 + % Fe: Deld. east of Mississippi River, 23,000 lb and over F.o.b. Riverton, N. J., west of Mississippi River	10.50 9.50
Electrolytic Iron: Melting stock, 99.9% Fe, irregular fragments of ⅛ in. x 1.3 in.	28.00
Annealed, 99.5% Fe..	36.50
Unannealed (99 + % Fe)	36.00
Unannealed (99 + % Fe) (minus 325 mesh)	59.00
Powder Flakes (minus 16, plus 100 mesh)..	29.00
Carbonyl Iron: 98.1-99.9%, 3 to 20 microns, depending on grade, 93.00-290.00 in standard 200-lb containers; all minus 200 mesh.	

Aluminum: Atomized, 500 lb drum, frght allowed Carlots	39.50
Ton lots	41.50
Antimony, 500 lb lots	42.00*
Brass, 5000-lb lots	31.30-38.40†
Bronze, 5000-lb lots	48.10-52.70†
Copper: Electrolytic	14.25*
Reduced	14.25*
Lead	7.50*
Manganese: Minus 35 mesh	64.00
Minus 100 mesh	70.00
Minus 200 mesh	75.00
Nickel unannealed	$1.15
Nickel-Silver, 5000-lb lots	49.20-61.30†
Phosphor-Copper, 5000-lb lots	59.80
Copper (atomized) 5000-lb lots	40.30-48.80‡
Silicon	47.50
Solder	7.00*
Stainless Steel, 304	$1.02
Stainless Steel, 316	$1.20
Tin	14.50*
Zinc, 5000-lb lots	17.50-30.70‡
Tungsten: Melting grade, 99% 60 to 2000 mesh: 1000 lb and over	Dollars 3.15
Less than 1000 lb	3.30
Chromium, electrolytic 99.8% Cr min metallic basis	5.00

*Plus cost of metal. †Depending on composition. ‡Depending on mesh.

Electrodes

Threaded with nipple; unboxed, f.o.b. plant

GRAPHITE

Inches Diam	Length	Per 100 lb
2	24	$60.75
2½	30	39.25
3	40	37.00
4	40	35.00
5⅛	40	34.75
6	60	31.50
7	60	28.25
8, 9, 10	60	28.00
12	72	26.75
14	60	26.75
16	72	25.75
17	60	26.25
18	72	26.25
20	72	25.25
24	84	26.00

CARBON

8	60	13.30
10	60	13.00
12	60	12.95
14	60	12.85
14	72	11.95
17	60	11.85
17	72	11.40
20	84	11.40
20	90	11.00
24	72, 84	11.25
24	96	10.95
30	84	11.05
40, 35	110	10.70
40	100	10.70

Imported Steel

(Base per 100 lb, landed, duty paid, based on current ocean rates. Any increase in these rates is for buyer's account. Source of shipment: Western continental European countries)

	North Atlantic	South Atlantic	Gulf Coast	West Coast
Deformed Bars, Intermediate, ASTM-A 305...	$6.30	$6.25	$6.25	$6.50
Bar Size Angles	6.62	6.57	6.57	6.75
Structural Angles	6.62	6.57	6.57	6.75
I-Beams	6.87	6.82	6.82	7.00
Channels	6.87	6.82	6.82	7.00
Plates (basic bessemer)	8.35	8.30	8.30	8.60
Sheets, H.R.	8.25	8.20	8.20	8.50
Sheets, C.R. (drawing quality)	9.00	8.95	8.95	9.25
Furring Channels, C.R., 1000 ft, ⅞ x 0.30 lb per ft	26.79	26.67	26.67	27.36
Barbed Wire (†)	6.95	6.95	6.95	7.40
Merchant Bars	6.87	6.82	6.82	7.22
Hot-Rolled Bands	7.20	7.15	7.15	7.55
Wire Rods, Thomas Commercial No. 5	6.73	6.73	6.73	7.13
Wire Rods, O.H. Cold Heading Quality No. 5	7.07	7.07	7.07	7.47
Bright Common Wire Nails (‡)	8.38	8.38	8.38	8.58

†Per 82 lb, net, reel. ‡Per 100-lb kegs, 20d nails and heavier.

Ores

Lake Superior Iron Ore

(Prices effective for the 1957 shipping season, gross ton, 51.50% iron natural, rail of vessel, lower lake ports.)

Mesabi bessemer	$11.60
Mesabi nonbessemer	11.45
Old Range bessemer	11.85
Old Range nonbessemer	11.70
Open-hearth lump	12.70
High phos.	11.45

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Jan. 30, 1957, and increases or decreases after that date are absorbed by the seller.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

New Jersey, foundry and basic 62-64% concentrates	25.00-27.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 65%	27.00-27.50
N. African hematite (spot)	nom.
Brazilian iron ore, 68-69%	*28.00*

Tungsten Ore

Net ton, unit

Foreign wolframite, good commercial quality	*$13.50-14.25**
Domestic, concentrates f.o.b. milling points	*20.00-22.00*

*Before duty.

Manganese Ore

Mn 46-48%, Indian (export tax included), $1.35-1.40 per long ton unit, c.i.f. U. S. ports, duty for buyer's account: other than Indian, $1.35-1.40; contracts by negotiation.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and Rhodesian

48% 3:1	*$51.00-53.00*
48% 2.8:1	*48.00-50.00*
48% no ratio	*41.00-43.00*

South African Transvaal

48% no ratio	*$40.00-43.00*
44% no ratio	*30.00-30.50*

Turkish

48% 3:1	*$59.00*

Domestic

Rail nearest seller

18% 3:1	$39.00

Molybdenum

Sulfide concentrate, per lb of Mo content, mines, unpacked	$1.18

Antimony Ore

Per short ton unit of Sb content, c.i.f. seaboard

55-60%	*$2.50-2.60*
60-65%	*2.60-2.90*

Vanadium Ore

Cents per lb V_2O_5

Domestic	31.00

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, Pa., furnace	$14.75-15.75
Connellsville, Pa., foundry	18.00-18.50

Oven Foundry Coke

Birmingham, ovens	$28.85
Cincinnati, deld.	31.84
Buffalo, ovens	30.50
Camden, N. J., ovens	29.50
Detroit, ovens	30.50
Pontiac, Mich., deld.	32.25
Saginaw, Mich., deld	33.83
Erie, Pa., ovens	30.50
Everett, Mass., ovens New England, deld.	31.55*
Indianapolis, ovens	29.75
Ironton, O., ovens	29.00
Cincinnati, deld.	31.84
Kearny, N. J., ovens	29.75
Milwaukee, ovens	30.50
Painesville, O., ovens	30.50
Cleveland, deld.	32.69
Philadelphia, ovens	29.50
St. Louis, ovens	31.50
Neville Island (Pittsburgh), Pa., ovens	29.25
St. Paul, ovens	29.75
Chicago, deld.	33.24
Swedeland, Pa., ovens	29.50
Terre Haute, Ind., ovens	29.75

*Or within $4.85 freight zone from works.

Coal Chemicals

Spot, cents per gallon, ovens

Pure benzene	36.00
Toluene, one deg.	29.50
Industrial xylene	32.00-34.00

Per ton, bulk, ovens

Ammonium sulfate	$32.00

Cents per pound, producing point

Phenol: Grade 1, 15.00; Grade 2-3, 14.50; Grade 4, 16.50; Grade 5, 15.25.

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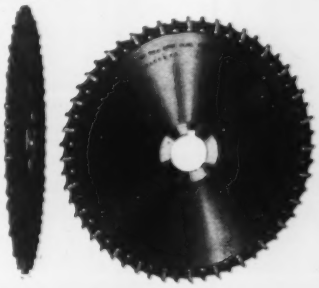
APEX TOOLS

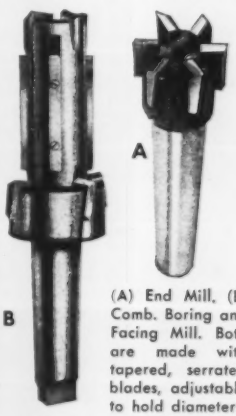
INSERTED-BLADE MILLING CUTTERS AND SINGLE-POINT TOOLS FOR ALL METAL-CUTTING NEEDS

In the Apex line, metal workers, especially in heavy industries, can have a very wide choice of types and sizes of cutters, with blades tipped with carbide, H. S. S., Stellite or Cobalt. The cutters shown here merely indicate the breadth of the Apex line. Our new catalog shows all. Send for one, it belongs in your equipment.

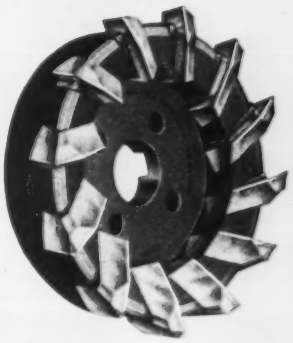
Thin, Alternate-Angle Cutter

Free cutting, for slots and keyways. Any width from 3/16"; diameters from 3" up. Drop-forged blades, adjustable to maintain width if desired. Also made with full radius, and in interlocking style as well.





(A) End Mill. (B) Comb. Boring and Facing Mill. Both are made with tapered, serrated blades, adjustable to hold diameters.



Apex offers milling cutters for many jobs. Above is shown one that takes a big chip fast! Made in diameters from 8" to 24". Cutters also available for lighter work of various types.

Shown at left is one of the famous Apex Shankless, Adjustable, Serrated, Single-Point Tools. Holders are available for every metal-removing job, with numerous standard-shape tool bits to choose from.

Apex bits of the type shown above will fit most standard tool holders.

Apex holders for round-shank tool bits are available in all sizes for all jobs. The tools are furnished ground, ready to use.

APEX TOOL & CUTTER CO., INC.
SHELTON 13, CONNECTICUT

Ferroalloys

MANGANESE ALLOYS

Spiegeleisen: Carlot, per gross ton, Palmerton, Pa. 21-23% Mn, $105; 19-21% Mn, 1-3% Si, $102.50; 16-19% Mn, $100.50.

Standard Ferromanganese: (Mn 74-76%, C 7% approx). Base price per net ton; $245, Johnstown, Duquesne, Sheridan, Pa.; Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. Add or subtract $2 for each 1% or fraction thereof of contained manganese over 76% or under 74% respectively.

(Mn 79-81%). Lump $263 per net ton, f.o.b. Anaconda or Great Falls, Mont. Add $2.60 for each 1% above 81%; subtract $2.60 for each 1% below 79%, fractions in proportion to nearest 0.1%.

High-Grade Low-Carbon Ferromanganese: (Mn 85-90%). Carload, lump, bulk, max 0.07% C, 35.1c per lb of contained Mn, carload packed 36.4c, ton lots 37.9c, less ton 39.1c. Delivered. Deduct 1.5c for max 0.15% C grade from above prices, 3c for max 0.03% C, 3.5c for max 0.50% C, and 6.5c for max 75% C—max 7% Si. **Special Grade:** (Mn 90% min, C 0.07% max, P 0.06% max). Add 2.05c to the above prices. Spot, add 0.25c.

Medium-Carbon Ferromanganese: (Mn 80-85%, C 1.25-1.5%, Si 1.5% max). Carload, lump, bulk, 25.5c per lb of contained Mn, packed, carload 26.8c, ton lot 28.4c, less ton 29.6c. Delivered. Spot, add 0.25c.

Manganese Metal: 2" x D (Mn 95.5% min, Fe 2% max, Si 1% max, C 0.2%). Carload, lump, bulk, 45c per lb of metal; packed, 45.75c; ton lot 47.25c; less ton lot 49.25c. Delivered. Spot, add 2c.

Electrolytic Manganese Metal: Min carload, 34c; 2000 lb to min carload, 36c; 500 lb to 1999 lb, 38c; 50 lb cans, add 0.5c per lb. Premium for hydrogen-removed metal, 0.75c per lb. Prices are f.o.b. cars, Knoxville, Tenn., freight allowed to St. Louis or any point east of Mississippi; or f.o.b. Marietta, O., freight allowed.

Silicomanganese: (Mn 65-68%). Contract, lump, bulk 1.50% C grade, 18-20% Si, 12.8c per lb of alloy. Packed, c.l. 14c, ton 14.45c, less ton 15.45c, f.o.b. Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. For 2% C grade, Si 15-17%, deduct 0.2c from above prices. For 3% C grade Si 12-14.5%, deduct 0.4c from above prices. Spot, add 0.25c.

TITANIUM ALLOYS

Ferrotitanium, Low-Carbon: (Ti 20-25%, Al 3.5% max, Si 4% max, C 0.10% max). Contract, ton lot, 2" x D, $1.50 per lb of contained Ti; less ton $1.55. (Ti 38-43%, Al 8% max, Si 4% max, C 0.10% max). Ton lot $1.35, less ton $1.37, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis. Spot, add 5c.

Ferrotitanium, High-Carbon: (Ti 15-18%, C 6-8%). Contract $200 per ton, f.o.b. Niagara Falls, N. Y., freight allowed to destinations east of Mississippi River and north of Baltimore and St. Louis.

Ferrotitanium, Medium-Carbon: (Ti 17-21%, C 2-4.5%). Contract $225 per ton, f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

CHROMIUM ALLOYS

High-Carbon Ferrochrome: Contract, c.l. lump, bulk 28.75c per lb of contained Cr; c.l. packed 30.30c, ton lot 32.05c; less ton 33.45c. Delivered. Spot, add 0.25c.

Low-Carbon Ferrochrome: Cr 63-66% (Simplex), carload, lump, bulk, C 0.025% max, 36.75c per lb contained Cr; 0.010% max, 37.75c. Ton lot, add 3.5c; less ton, add 5.2c. Delivered.
Cr 67-71%, carload, lump, bulk, C 0.02% max, 41.00c per lb contained Cr; 0.025% max, 39.75c; 0.05% max, 39.00c; 0.10% max, 38.50c; 0.20% max, 38.25c; 0.50% max, 38.00c; 1.0% max, 37.75c; 1.5% max, 37.50c; 2.0% max, 37.25c. Ton lot, add 3.4c; less ton lot, add 5.1c. Delivered.

Foundry Ferrochrome, High-Carbon: (Cr 62-66%, C 5-7%, Si 7-10%). Contract, c.l., 2 in. x D, bulk 30.05c per lb of contained Cr. Packed, c.l. 31.65c, ton 33.45c, less ton 34.95c. Delivered. Spot, add 0.25c.

Foundry Ferrosilicon Chrome: (Cr 50-54%, Si 28-32%, C 1.25% max). Contract, carload, packed, 8M x D, 21.25c, per lb of alloy, ton lot 22.50c; less ton lot 23.70c. Delivered. Spot, add 0.25c.

Ferrochrome-Silicon: Cr 39-41%, Si 42-45%, C 0.05% max or Cr 33-36%, Si 45-48%, C 0.05% max. Carload, lump, bulk, 3" x down and 2" x down, 27.50c per lb contained Cr, 14.20c per lb contained Si. 0.75" x down, 28.65c per lb contained Cr, 14.20c per lb contained Si. Delivered.

Chromium Metal Electrolytic: Commercial grade (Cr 99.8% min, metallic basis, Fe 0.2% max). Contract, carlot, packed 2" x D plate (about ⅛" thick) $1.29 per lb, ton lot $1.31, less ton lot $1.33. Delivered. Spot, add 5c.

VANADIUM ALLOYS

Ferrovanadium: Open-hearth grade (V 50-55%, Si 8% max, C 3% max). Contract, any quantity, $3.20 per lb of contained V. Delivered. Spot, add 10c. **Special Grade:** (V 50-55% or 70-75%, Si 2% max, C 0.5% max) $3.30. **High Speed Grade:** (V 50-55%, or 70-75%, Si 1.50% max, C 0.20% max) $3.40.

Grainal: Vanadium Grainal No. 1 $1.05 per lb; No. 6, 68c; No. 79, 50c, freight allowed.

Vanadium Oxide: Contract less carload lot, packed $1.38 per lb contained V_2O_5, freight allowed. Spot, add 5c.

SILICON ALLOYS

25-30% Ferrosilicon: Contract, carload, lump, bulk, 20.0c per lb of contained Si. Packed 21.40c; ton lot 22.50c, f.o.b. Niagara Falls, N. Y., freight not exceeding St. Louis rate allowed.

50% Ferrosilicon: Contract, carload, lump, bulk, 14.20c per lb of contained Si. Packed c.l. 16.70c, ton lot 18.15c, less ton 19.80c, f.o.b. Alloy, W. Va.; Ashtabula, Marietta, O.; Sheffield, Ala.; Portland, Oreg. Spot, add 0.45c.

Low-Aluminum 50% Ferrosilicon: (Al 0.40% max). Add 1.45c to 50% ferrosilicon prices.

65% Ferrosilicon: Contract, carload, lump, bulk, 15.25c per lb contained silicon. Packed, c.l. 17.25c, ton lot 19.05c; less ton 20.4c. Delivered. Spot, add 0.35c.

75% Ferrosilicon: Contract, carload, lump, bulk, 16.4c per lb of contained Si. Packed, c.l. 18.30c, ton lot 19.95c, less ton 21.2c. Delivered. Spot, add 0.3c.

90% Ferrosilicon: Contract, carload, lump, bulk, 19.5c per lb of contained Si. Packed, c.l. 21.15c, ton lot 22.55c, less ton 23.6c. Delivered. Spot, add 0.25c.

Silicon Metal: (98% min Si, 0.75% max Fe, 0.07% max Ca). C.l. lump, bulk, 22.00c per lb of Si. Packed, c.l. 23.65c, ton lot 24.95c, less ton 25.95c. Add 0.5c for max 0.03% Ca grade. Deduct 0.5c for max 1% Fe grade analyzing min 99.75% Si; 0.75c for max 1.25% Fe grades analyzing min 96.75% Si. Spot, add 0.25c.

Alsifer: (Approx 20% Al, 40% Si, 40% Fe). Contract, basis f.o.b. Niagara Falls, N. Y., lump, carload, bulk, 10.65c per lb of alloy; ton lot, packed, 11.8c.

ZIRCONIUM ALLOYS

12-15% Zirconium Alloy: (Zr 12-15%, Si 39-43%, C 0.20% max). Contract, c.l. lump, bulk 9.25c per lb of alloy. Packed, c.l. 10.45c, ton lot 11.6c, less ton 12.45c. Delivered. Spot, add 0.25c.

35-40% Zirconium Alloy: (Zr 35-40%, Si 47-52%, Fe 8-12%, C 0.50% max). Contract, carload, lump, packed 27.25c per lb of alloy, ton lot 28.4c, less ton 29.65c. Freight allowed. Spot, add 0.25c.

BORON ALLOYS

Ferroboron: (B 17.50% min, Si 1.50% max, Al 0.50% max, C 0.50% max). Contract, 100 lb or more 1" x D, $1.20 per lb of alloy; less than 100 lb $1.30. Delivered. Spot, add 5c. F.o.b. Washington, Pa., prices, 100 lb and over, are as follows: Grade A (10-14% B) 85c per lb; Grade B (14-18% B) $1.20; Grade C (19% min B) $1.50.

Borosil: (3 to 4% B, 40 to 45% Si). Carload, bulk, lump, or 3" x D, $5.25 per lb of contained B. Packed, carload $5.40, ton to c.l. $5.50, less ton $5.60. Delivered.

Bortam: (B 1.5-1.9%). Ton lot, 45c per lb; less than ton lot, 50c per lb.

Carbortam: (1 to 2%). Contract, lump, carload 9.50c per lb f.o.b. Suspension Bridge, N. Y., freight allowed same as high-carbon ferrotitanium.

CALCIUM ALLOYS

Calcium-Manganese-Silicon: (Ca 16-20%, Mn 14-18% and Si 53-59%). Contract, carload, lump, bulk 23c per lb of alloy, carload packed 24.25c, ton lot 26.15c, less ton 27.15c. Delivered. Spot, add 0.25c.

Calcium-Silicon: (Ca 30-33%, Si 60-65%, Fe 1.5-3%). Contract, carload, lump, bulk 24c per lb of alloy, carload packed 25.65c, ton lot 27.95c, less ton 29.45c. Delivered. Spot, add 0.25c.

BRIQUETTED ALLOYS

Chromium Briquets: (Weighing approx 3¾ lb each and containing 2 lb of Cr). Contract, carload, bulk 19.60c per lb of briquet, carload packed in box pallets 19.80c, in bags 20.70c; 3000 lb to c.l. in box pallets 21.00c; 2000 lb to c.l. in bags, 21.90c; less than 2000 lb in bags 22.80c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Ferromanganese Briquets: (Weighing approx 3 lb and containing 2 lb of Mn). Contract, carload, bulk 14.8c per lb of briquet; c.l., packed, pallets 15c, bags 16c; 3000 lb to c.l., pallets 16.2c; 2000 lb to c.l. bags, 17.2c; less ton 18.1c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicomanganese Briquets: (Weighing approx 3½ lb and containing 2 lb of Mn and approx ½ lb of Si). Contract, c.l. bulk 15.1c per lb of briquet; c.l. packed, pallets, 15.3c; bags 16.3c, 3000 lb to c.l., pallets, 16.5c; 2000 lb to c.l., bags 17.5c; less ton 18.4c. Delivered. Add 0.25c for notching. Spot, add 0.25c.

Silicon Briquets: (Large size—weighing approx 5 lb and containing 2 lb of Si). Contract, carload, bulk 7.7c per lb of briquet; packed, pallets, 7.9c; bags 8.9c; 3000 lb to c.l., pallets 9.5c; 2000 lb to c.l. bags 10.5c; less ton 11.4c. Delivered. Spot, add 0.25c. (Small size—weighing approx 2½ lb and containing 1 lb of Si). Carload, bulk 7.85c. Packed, pallets 8.05c; bags 9.05c; 3000 lb to c.l. pallets 9.65c; 2000 lb to c.l. bags 10.65c; less ton 11.55c. Delivered. Add 0.25c for notching, small size only. Spot, add 0.25c.

Molybdic-Oxide Briquets: (Containing 2½ lb of Mo each). $1.41 per pound of Mo contained, f.o b. Langeloth, Pa.

TUNGSTEN ALLOYS

Ferrotungsten: (70-80%). 5000 lb W or more $2.95 per lb of contained W; 2000 lb W to 5000 lb W, $3.05; less than 2000 lb W, $3.17. Delivered.

OTHER FERROALLOYS

Ferrocolumbium: (Cb 50-60%, Si 8% max, C 0.4% max). Contract, ton lot 2" x D, $4.90 per lb of contained Cb. Delivered. Spot, add 10c.

Ferrotantalum—Columbium: (Cb 40% approx Ta 20% approx, and Cb plus Ta 60% min, C 0.30% max). Ton lot 2" x D, $4.25 per lb of contained Cb plus Ta, delivered; less ton lot $4.30.

SMZ Alloy: (Si 60-65%, Mn 5-7%, Zr 5.7%, Fe 20% approx). Contract, c.l. packed ½-in. x 12 M 20.00c per lb of alloy, ton lot 21.15c, less ton 22.40c. Delivered. Spot, add 0.25c.

Graphidox No. 5: (Si 48-52%, Ca 5.7%, Ti 9-11%). C.l. packed, 19c per lb of alloy, ton lot 20.15c; less ton lot 21.4c, f.o.b. Niagara Falls, N. Y.; freight allowed to St. Louis.

V-5 Foundry Alloy: (Cr 38-42%, Si 17-19%, Mn 8-11%). C.l. packed 18.1c per lb of alloy; ton lot 19.55c; less ton lot 20.8c, f.o.b. Niagara Falls, N. Y., freight allowed to St. Louis.

Simanal: (Approx 20% each Si, Mn, Al; bal Fe). Lump, carload, bulk 18.50c. Packed c.l. 19.50c, 2000 lb to c.l. 20.50c, less than 2000 lb 21c per lb of alloy. Delivered.

Ferrophosphorus: (23-25% based on 24% P content with unitage of $4 for each 1% of P above or below the base); carload, f.o.b. sellers' works, Mt. Pleasant, Sigio, Tenn., $110 per gross ton.

Ferromolybdenum: (55-75%). Per lb of contained Mo, in 200-lb container, f.o.b. Langeloth and Washington, Pa., $1.68 in all sizes except powdered which is $1.74.

Technical Molybdic-Oxide: Per lb of contained Mo, in cans, $1.39; in bags, $1.38, f.o.b. Langeloth and Washington, Pa.

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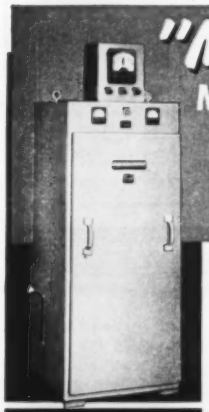
PASCAGOULA, MISSISSIPPI



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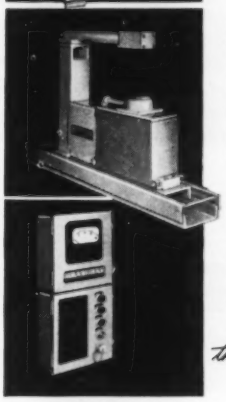
MEASURES THICKNESS ACCURATELY *without TOUCHING the MATERIAL*



Hot or Cold Strip Steel, Brass, Copper, Aluminum . . . Plastics, Foils, Coated Fabrics, Film, Rubber, Etc., Even When Moving At High Speed.

Simple method—the "Measuray" shoots X-Rays through the material—measures its absorption of the rays. Calibrated meter registers plus or minus per cent of deviation from pre-determined standard. Especially useful on hot mills where material can't be checked by contact gages. Also when material can be deformed by contact such as foil.

"Measuray" is accurate to 1% of thickness or less. Quickly pays for itself in reduced scrap.

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You can design with unrestricted imagination when you plan to use metal stampings for parts or complete assemblies. Simple and complex forms can be combined in a single stamping to add new beauty . . . increase functional efficiency . . . reduce production operations.

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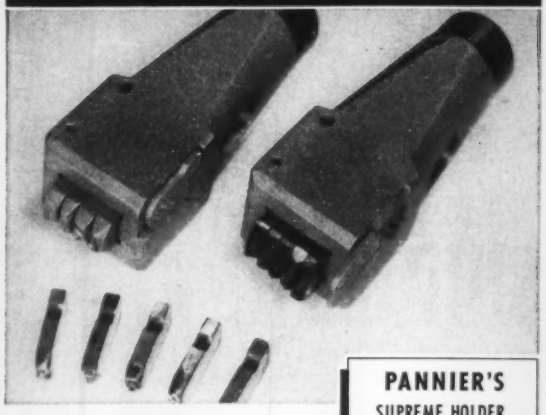

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If your company performs plating, galvanizing, finishing or any one of dozens of metalworking operations on a contract basis, you can attract new customers by inserting an advertisement in the classified pages of STEEL.

Scrap Is Not Yet Bumping Bottom

Sharp decline in prices continues for tenth consecutive week. STEEL's index on the prime grade drops another $1. The $36.83 level is the lowest in more than two years

Scrap Prices, Page 280

Pittsburgh — Prices on leading scrap grades dipped again last week, following reports that No. 2 bundles are selling at $30 and $31 a ton. The effect of these sales was to lower the nominal No. 1 heavy melting price by $1.

Philadelphia—Due mainly to a general marking of time by buyers and sellers, domestic scrap prices for the first time in recent weeks showed little change. No. 1 heavy melting is higher at $37.50-$39, delivered, with the outside figure representing a purchase by a mill within cometitive range of the export market. Heavy turnings are lower at $33.50, off 50 cents a ton.

New York — Brokers have reduced their buying prices due to lagging demand. No. 1 heavy melting and No. 1 bundles are down $2 to a range of $35-$36, and No. 2 heavy melting is off more than $2 to $29-$31. No. 2 bundles have dropped $1 to $24-$25. Unstripped motor blocks are quoted $32-$33, and heavy breakable cast $34-$35.

Chicago—Weakness continues in the scrap market here, and prices on leading grades are off another $1 to $4 a ton. Mill buying is extremely sparse, and a transaction as small as 500 tons becomes significant in determining prices. Generally, broker buying to fulfill outstanding orders is the only market indicator. With material not moving, dealers are unable to reduce their yard stocks and are fearful of increasing them. Consumers have generous inventories, and with the steelmaking rate failing to register the anticipated fourth quarter upturn, they are extremely selective in making purchases.

Cleveland—With the steel mills sitting on the sidelines, the scrap market here lacks activity. Quoted prices are nominal in the absence of a representative buy. Although No. 1 heavy melting is quoted at $32-$33, some consumers think they could get a price under that level if they entered the market for sizable tonnages. Expectations are automotive lists will go at prices substantially under those of a month ago when they close this week.

Youngstown—Scrap prices here are nominal and lower with no mill buying in sight. The mills are reported piling home scrap and some industrial material. The sluggish market is discouraging collection by peddlers.

Detroit — Pessimism prevails among local scrap dealers and brokers. Local dealers think the market is in for another slide, having heard that industrial bundles sold elsewhere for $24.

Yards are full and docks in Detroit and Saginaw, Mich., are

(*Please turn to Page* 285)

QUANTITY PRODUCTION OF GREY IRON CASTINGS

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FOUNDRY EQUIPMENT

A 8530-1/3

Iron and Steel Scrap

Consumer prices per gross ton, except as otherwise noted, including broker's commission, as reported to STEEL, Oct. 23, 1957. *Changes shown in italics.*

STEELMAKING SCRAP COMPOSITE

Oct. 23	$36.83
Oct. 16	37.83
Sept. Avg.	47.73
Oct. 1956	57.27
Oct. 1952	43.00

Based on No. 1 heavy melting grade at Pittsburgh, Chicago, and eastern Pennsylvania.

PITTSBURGH

No. 1 heavy melting	*37.00-38.00*
No. 2 heavy melting	33.00-34.00
No. 1 factory bundles	43.00-44.00
No. 1 dealer bundles	*37.00-38.00*
No. 2 bundles	*30.00-31.00*
No. 1 busheling	*37.00-38.00*
Machine shop turnings	20.00-21.00
Mixed borings, turnings	20.00-21.00
Short shovel turnings	23.00-24.00
Cast iron borings	23.00-24.00
Cut structurals:	
2 ft and under	*44.00-45.00*
3 ft lengths	*43.00-44.00*
Heavy turnings	*35.00-36.00*
Punchings & plate scrap	44.00-45.00
Electric furnace bundles	44.00-45.00

Cast Iron Grades

No. 1 cupola	*42.00-43.00*
Stove plate	*36.00-37.00*
Unstripped motor blocks	*29.00-30.00*
Clean auto cast	*45.00-46.00*
Drop broken machinery	*54.00-55.00*

Railroad Scrap

No. 1 R.R. heavy melt.	41.00-42.00
Rails, 2 ft and under	*61.00-62.00*
Rails, 18 in. and under	*62.00-63.00*
Angles, splice bars	55.00-56.00
Rails, rerolling	*61.00-62.00*

Stainless Steel Scrap

18-8 bundles & solids	210.00-215.00
18-8 turnings	115.00-120.00
430 bundles & solids	95.00-100.00
430 turnings	65.00-70.00

CLEVELAND

No. 1 heavy melting	*32.00-33.00*
No. 2 heavy melting	*25.00-26.00*
No. 1 factory bundles	*35.00-36.00*
No. 1 bundles	*32.00-33.00*
No. 2 bundles	*22.00-23.00*
No. 1 busheling	*32.00-33.00*
Machine shop turnings	*12.00-13.00*
Short shovel turnings	*16.00-17.00*
Mixed borings, turnings	*16.00-17.00*
Cast iron borings	*16.00-17.00*
Cut foundry steel	*34.00-35.00*
Cut structurals, plates 2 ft and under	*39.00-40.00*
Low phos. punchings & plate	*33.00-34.00*
Alloy free, short shovel turnings	*22.00-23.00*
Electric furnace bundles	*33.00-34.00*

Cast Iron Grades

No. 1 cupola	*42.00-43.00*
Charging box cast	*34.00-35.00*
Heavy breakable cast	*32.00-33.00*
Stove plate	*40.00-41.00*
Unstripped motor blocks	*27.00-28.00*
Brake shoes	*31.00-32.00*
Clean auto cast	*42.00-43.00*
Burnt cast	*29.00-30.00*
Drop broken machinery	*46.00-47.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*37.00-38.00*
R.R. malleable	*53.00-54.00*
Rails, 2 ft and under	*60.00-61.00*
Rails, 18 in. and under	*61.00-62.00*
Rails, random lengths	*55.00-56.00*
Cast steel	*52.00-53.00*
Railroad specialties	*52.00-53.00*
Uncut tires	*47.00-48.00*
Angles, splice bars	*52.00-53.00*
Rails, rerolling	*60.00-61.00*

Stainless Steel
(Brokers' buying prices; f.o.b. shipping point)

18-8 bundles, solids	*210.00-215.00*
18-8 turnings	*110.00-115.00*
430 clips, bundles, solids	75.00-80.00
430 turnings	40.00-50.00

YOUNGSTOWN

No. 1 heavy melting	*35.00-36.00*
No. 2 heavy melting	*30.00-31.00*
No. 1 bundles	*35.00-36.00*
No. 2 bundles	*27.00-28.00*
No. 1 busheling	*35.00-36.00*
Machine shop turnings	*14.00-15.00*
Short shovel turnings	*18.00-19.00*
Cast iron borings	*18.00-19.00*
Low phos.	*38.00-39.00*
Electric furnace bundles	*38.00-39.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*40.00-41.00*

CHICAGO

No. 1 heavy melt., indus.	*36.00-37.00*
No. 1 hvy melt., dealer	*33.00-34.00*
No. 2 heavy melting	*29.00-30.00*
No. 1 factory bundles	*38.00-39.00*
No. 1 dealer bundles	*34.00-35.00*
No. 2 bundles	*21.00-22.00*
No. 1 busheling, indus.	*36.00-37.00*
No. 1 busheling dealer	*33.00-34.00*
Machine shop turnings	*17.00-18.00*
Mixed borings, turnings	*19.00-20.00*
Short shovel turnings	*19.00-20.00*
Cast iron borings	*19.00-20.00*
Cut structurals, 3 ft.	*40.00-41.00*
Punchings & plate scrap	*41.00-42.00*

Cast Iron Grades

No. 1 cupola	*35.00-36.00*
Stove plate	*34.00-35.00*
Unstripped motor blocks	*27.00-28.00*
Clean auto cast	*40.00-41.00*
Drop broken machinery	*40.00-41.00*

Railroad Scrap

No. 1 R.R. heavy melt.	*39.00-40.00*
R.R. malleable	*47.00-48.00*
Rails, 2 ft and under	*51.00-52.00*
Rails, 18 in. and under	*52.00-53.00*
Angles, splice bars	*48.00-49.00*
Axles	*52.00-53.00*
Rails, rerolling	*52.00-53.00*

Stainless Steel Scrap

18-8 bundles & solids	205.00-215.00
18-8 turnings	105.00-115.00
430 bundles & solids	80.00-90.00
430 turnings	50.00-55.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*26.00-27.00†*
No. 2 heavy melting	*23.00-24.00†*
No. 1 bundles	*24.00-26.00†*
No. 2 bundles	*20.00-21.00†*
No. 1 busheling	*25.00-26.00†*
Machine shop turnings	*10.00-11.00†*
Mixed borings, turnings	*11.00-12.00†*
Short shovel turnings	*13.00-14.00†*
Punchings & plate scrap	*26.00-27.00†*

Cast Iron Grades

No. 1 cupola	*34.00†*
Stove plate	*29.00†*
Charging box cast	*28.00†*
Heavy breakable	*28.00†*
Unstripped motor blocks	*15.00†*
Clean auto cast	*35.00†*
Malleable	*36.00†*

†Nominal

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	39.00
No. 2 heavy melting	37.00
No. 1 bundles	39.00
No. 2 bundles	29.00
No. 1 busheling	39.00
Machine shop turnings	17.00
Short shovel turnings	19.00

Cast Iron Grades

No. 1 cupola	45.00
Charging box cast	37.00
Heavy breakable cast	37.00
Unstripped motor blocks	37.00
Brake shoes	40.00
Clean auto cast	46.00
Stove plate	39.00

Railroad Scrap

No. 1 R.R. heavy melt.	42.00
Rails, 18 in. and under	59.00
Rails, random lengths	52.00
Rails, rerolling	60.00
Angles, splice bars	52.00

PHILADELPHIA

No. 1 heavy melting	*37.00-39.00*
No. 2 heavy melting	33.50
No. 1 bundles	37.50-38.50
No. 2 bundles	27.50
No. 1 busheling	37.50-38.50
Electric furnace bundles	45.00
Mixed borings, turnings	23.00†
Short shovel turnings	25.00
Machine shop turnings	22.00†
Heavy turnings	*33.50*
Structurals & plate	46.00-48.00
Couplers, springs, wheels	56.00
Rail crops, 2 ft & under	68.00-69.00

Cast Iron Grades

No. 1 cupola	43.00
Heavy breakable cast	42.00
Malleable	59.00
Drop broken machinery	51.00-52.00

†Nominal

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	*35.00-36.00*
No. 2 heavy melting	*29.00-31.00*
No. 1 bundles	*35.00-36.00*
No. 2 bundles	*24.00-25.00*
Machine shop turnings	12.00-13.00
Mixed borings, turnings	14.00-15.00
Short shovel turnings	16.00-17.00
Low phos. (structurals & plate	46.00-47.00†

Cast Iron Grades

No. 1 cupola	39.00-40.00
Unstripped motor blocks	*32.00-33.00*
Heavy breakable	*34.00-35.00*

Stainless Steel

18-8 sheets, clips, solids	175.00-185.00
18-8 borings, turnings	75.00-80.00
430 sheets, clips, solids	55.00-60.00
410 sheets, clips, solids	50.00-55.00

†Nominal

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*32.00-33.00*
No. 2 heavy melting	29.00-30.00
No. 1 bundles	*32.00-33.00*
No. 2 bundles	*27.00-28.00*
No. 1 busheling	32.00-33.00
Machine shop turnings	10.00-11.00
Mixed borings, turnings	11.00-12.00
Short shovel turnings	12.00-13.00
No. 1 cast	33.00-34.00
Mixed cupola cast	32.00-33.00
No. 1 machinery cast	38.00-39.00

BUFFALO

No. 1 heavy melting	*36.00-37.00*
No. 2 heavy melting	*32.50-33.50*
No. 1 bundles	*36.00-37.00*
No. 2 bundles	*29.50-30.50*
No. 1 busheling	*36.00-37.00*
Mixed borings, turnings	*21.00-22.00*
Machine shop turnings	*19.00-20.00*
Short shovel turnings	*22.00-23.00*
Cast iron borings	*21.00-22.00*
Low phos.	*41.00-42.00*

Cast Iron Grades
(F.o.b. shipping point)

No. 1 cupola	43.00-44.00
No. 1 machinery	47.00-48.00

Railroad Scrap

Rails, random lengths	*50.00-51.00*
Rails, 3 ft and under	*55.00-56.00*
Railroad specialties	*43.00-44.00*

CINCINNATI

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	36.00-37.00
No. 2 heavy melting	32.00-33.00
No. 1 bundles	36.00-37.00
No. 2 bundles	27.00-28.00
No. 1 busheling	36.00-37.00
Machine shop turnings	20.00-21.00
Mixed borings, turnings	21.00-22.00
Short shovel turnings	22.00-23.00
Cast iron borings	21.00-22.00
Low phos. 18 in.	43.00-44.00

Cast Iron Grades

No. 1 cupola	36.00-37.00
Heavy breakable cast	33.00-34.00
Charging box cast	33.00-34.00
Drop broken machinery	48.00-49.00

Railroad Scrap

No. 1 R.R. heavy melt.	39.00-40.00
Rails, 18 in. and under	62.00-63.00
Rails, random lengths	54.00-55.00

BIRMINGHAM

No. 1 heavy melting	36.00-37.00
No. 2 heavy melting	31.00-32.00
No. 1 bundles	36.00-37.00
No. 2 bundles	21.00-22.00
No. 1 busheling	36.00-37.00
Cast iron borings	*22.00-23.00*
Short shovel turnings	21.00-22.00
Machine shop turnings	21.00-22.00
Bar crops and plates	41.00-42.00
Structurals & plate	41.00-42.00
Electric furnace bundles	40.00-41.00
Electric furnace:	
3 ft and under	38.00-39.00
2 ft and under	39.00-40.00

Cast Iron Grades

No. 1 cupola	47.00-48.00
Stove plate	46.00-47.00
Unstripped motor blocks	38.00-39.00
Charging box cast	27.00-28.00
No. 1 wheels	39.00-40.00

Railroad Scrap

No. 1 R.R. heavy melt.	*37.00-38.00*
Rails, 18 in. and under	51.00-52.00
Rails, rerolling	55.00-56.00
Rails, random lengths	47.00-48.00
Angles, splice bars	*43.00-44.00*

SEATTLE

No. 1 heavy melting	35.00†
No. 1 bundles	33.00†
No. 2 heavy melting	33.00†
No. 2 bundles	22.00†
Machine shop turnings	*26.00*
Mixed borings, turnings	*26.00*
Electric furnace No. 1	*35.00†*

Cast Iron Grades

No. 1 cupola	35.00†
Heavy breakable cast	32.00†
Unstripped motor blocks	27.00†
Stove plate (f.o.b. plant)	25.00†

†Nominal

LOS ANGELES

No. 1 heavy melting	44.00
No. 2 heavy melting	42.00
No. 1 bundles	43.00
No. 2 bundles	34.00
Machine shop turnings	31.00
Shoveling turnings	30.00
Cast iron borings	30.00
Cut structurals and plate, 1 ft and under	58.00

Cast Iron Grades
(F.o.b. shipping point)

No. 1 cupola	54.00-56.00

Railroad Scrap

No. 1 R.R. heavy melt.	44.00

SAN FRANCISCO

No. 1 heavy melting	39.00
No. 2 heavy melting	37.00
No. 1 bundles	38.00
No. 2 bundles	30.00
Machine shop turnings	27.00
Mixed borings, turnings	27.00
Cast iron borings	27.00
Heavy turnings	27.00
Short shovel turnings	27.00
Cut structurals, 3 ft.	50.00

Cast Iron Grades

No. 1 cupola	50.00-52.00
Charging box cast	45.00
Stove plate	46.00
Heavy breakable cast	40.00
Unstripped motor blocks	40.00
Clean auto cast	50.00-52.00
No. 1 wheels	45.00
Drop broken machinery	50.00-52.00

HAMILTON, ONT.

No. 1 heavy melting	38.00
No. 2 heavy melting	33.00
No. 1 bundles	38.00
No. 2 bundles	28.00
Mixed steel scrap	33.00
Mixed borings, turnings	21.00
Busheling, new factory:	
Prepared	38.00
Unprepared	32.00
Short steel turnings	23.00
Rails, rerolling	47.00

Cast Iron Grades†

No. 1 machinery cast	50.00

†F.o.b. Hamilton, Ont.

GREAT MOMENTS IN THE HISTORY OF IRON AND STEEL MAKING

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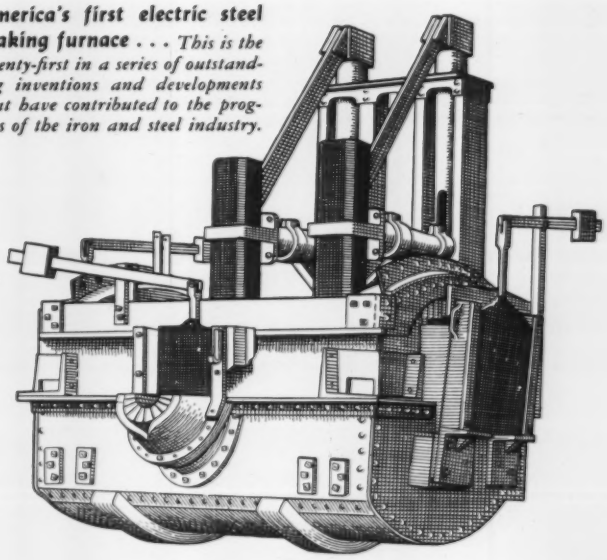
America's first electric steel making furnace *. . . This is the twenty-first in a series of outstanding inventions and developments that have contributed to the progress of the iron and steel industry.*



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Disparity between U. S. and foreign wages allows overseas producers to undersell domestic prices by as much as 25 per cent. Copper, lead, and zinc remain weak

Nonferrous Metal Prices, Pages 284 & 285

IMPORTS OF BRASS mill products are seriously affecting domestic producers' shipments at a time when demand is off.

The reason's simple. Lower wage scales allow foreign producers to sell their wares here for 5 to 25 per cent under the American quotation. T. E. Veltfort, managing director of the Copper & Brass Research Association, New York, gives these examples: Certain types of copper tubing sell for 12 to 15 cents a pound less than their U. S. equivalents; brass tubing is 21 cents a pound cheaper; welding rods are 16 cents a pound cheaper.

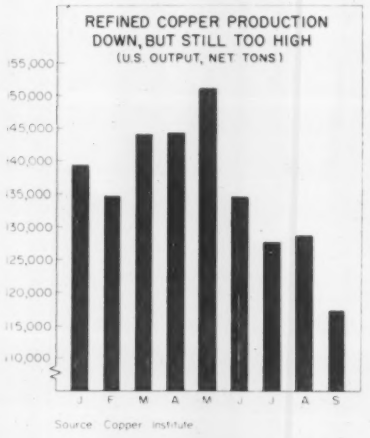
Those prices have wooed many customers away from domestic mills. For example: Imports of seamless brass tubing came to only 0.96 per cent of the domestic market in 1950. But during the first half of this year, the figure jumped to 16 per cent. Copper sheets offer another example: Between 1950 and 1957 imports rose from 4.3 per cent to 8.9 per cent of the domestic market.

U. S. exports are falling. During the 1930-39 period, they were 5.44 per cent of domestic shipments, versus 0.66 per cent today.

Differential—American producers, paying an average hourly wage of $2.12 (1956 industry average), start off with three strikes against them when it comes to competing pricewise, says Mr. Veltfort. The 1955 wage rate table of the International Labor Office lists these hourly figures: U. S. average, $1.88; United Kingdom, 66 cents; Germany, 47 cents; France, 40 cents; Sweden, 90 cents; and Japan, 22 cents.

Solution? — Mr. Veltfort sees three possible remedies: 1. Establishment of quotas. 2. Increased tariffs. 3. A wage-cost equalization tax.

The quota system has several disadvantages, the main one being it might cause discrimination among importers and exporters, says Mr. Veltfort. Tariffs would have to be substantial before they would become effective. (During 1930-38, the average duty ran 9.8 cents a pound. Between 1950 and 1956 it dropped to 2 cents.)



The best system, believes Mr. Veltfort, is to work out a wage-cost equalization tax.

Metals Still Weak

Lack of demand, continued weakness in foreign prices, and the softness in the stock market hold back any noticeable strengthening in copper, lead, and zinc.

Copper—Orders run "poor" to "satisfactory." The 0.5 cent a pound price cut in custom smelted copper on Oct. 15 did little to stimulate demand. Further fluctuations would surprise no one in the trade. One bright spot: U. S. refined production fell about 11,000 tons in September (see chart); refined stocks dropped 16,118 tons to the 176,813 ton mark.

Lead—Several producers report demand is still off, making the price vulnerable. But at least one company says the 0.5 cent a pound price cut on Oct. 14 is stimulating an across-the-board pickup. A few buyers feel that prices have reached bottom.

Zinc — Estimates on business vary, but the over-all market remains extremely weak. There are more and more reports of price shading, discounts, and "special allowances." Prices could fall at any time, but the industry is hoping the line will be held until the Tariff Commission reaches a decision on an import tax.

Aluminum Notes

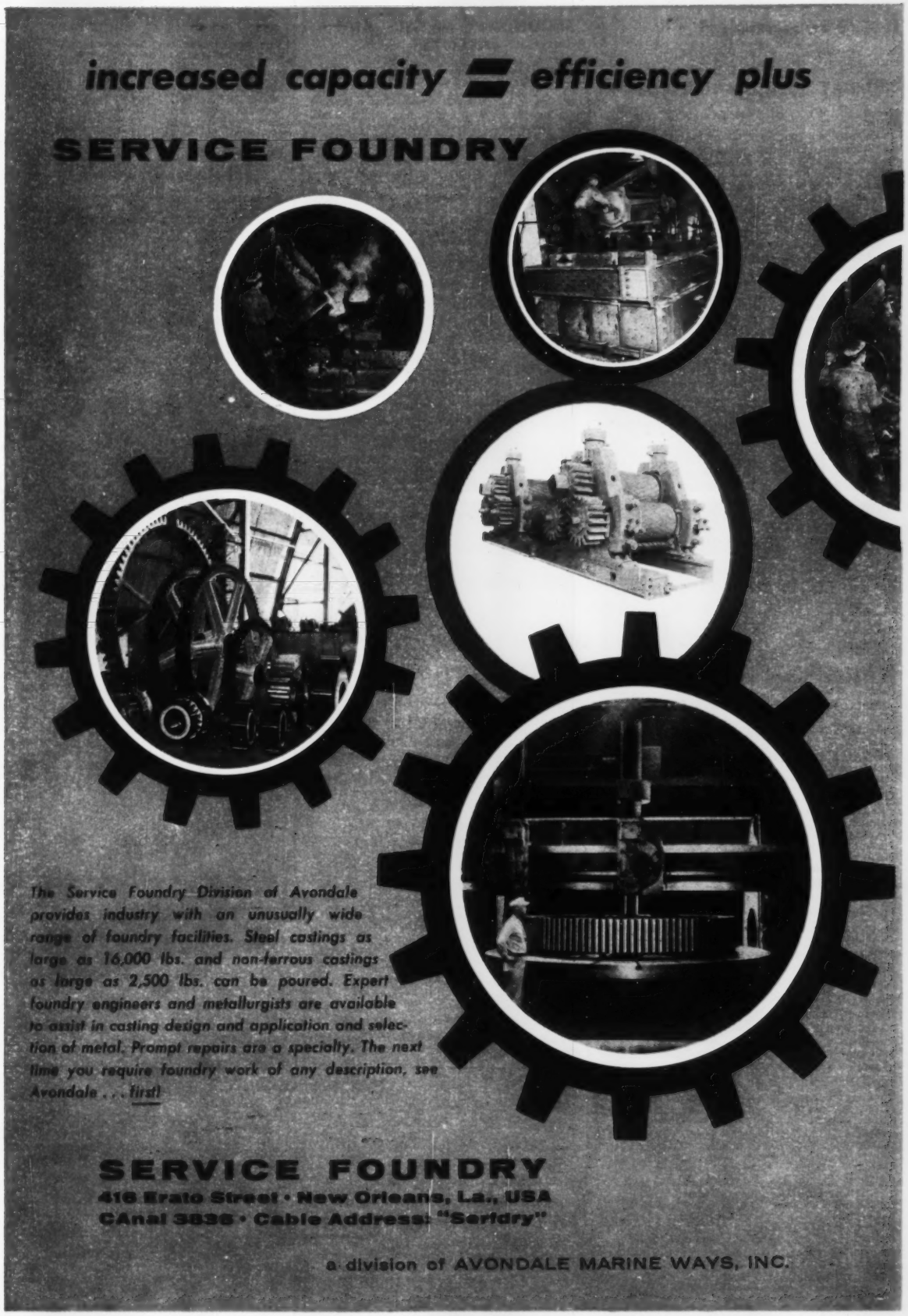
Primary producers turned out 1,239,010 tons of aluminum in the first nine months of this year, compared with 1,236,650 tons in the same period of 1956.

The government will take 59,500 tons of aluminum in 1958's first quarter for Defense Department and Atomic Energy Commission needs. The tonnage is slightly less than that taken in this year's fourth quarter.

NONFERROUS PRICE RECORD

	Price Oct. 23	Last Change	Previous Price	Sept. Avg	Aug. Avg	Oct., 1956 Avg
Aluminum ..	28.10	Aug. 1, 1957	27.10	28.100	28.100	27.100
Copper	25.50–27.00	Oct. 15, 1957	26.00–27.00	26.469	28.639	38.365
Lead	13.30	Oct. 14, 1957	13.80	13.800	13.800	15.800
Magnesium .	35.25	Aug. 13, 1956	33.75	35.250	35.250	35.250
Nickel	74.00	Dec. 6, 1956	64.50	74.000	74.000	64.500
Tin	91.25	Oct. 23, 1957	91.125	93.422	94.259	105.981
Zinc	10.00	July 1, 1957	10.50	10.000	10.000	13.500

Quotations in cents per pound based on: COPPER, deld. Conn. Valley; LEAD, common grade, deld. St. Louis; ZINC, prime western, E. St. Louis; TIN, Straits, deld. New York; NICKEL, electrolytic cathodes, 99.9%, base size at refinery, unpacked; ALUMINUM, primary ingots, 99 + %, deld.; MAGNESIUM, pig, 99.8%, Velasco, Tex.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Nonferrous Metals

Cents per pound, carlots except as otherwise noted.

PRIMARY METALS AND ALLOYS

Aluminum: 99.5%, pigs, 26.00; ingots, 28.10, 10,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 29.90; No. 43, 29.70; No. 195, 31.30; No. 241, 31.50; No. 356, 29.90, 30-lb ingots.

Antimony: R.M.M. brand, 99.5%, 33.00; Lone Star brand, 33.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.50-28.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97% lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, with balance as Al at market price, f.o.b. shipping point.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment data, f.o.b. shipping point.

Bismuth: $2.25 per ton, ton lots.

Cadmium: Sticks and bars, $1.70 per lb deld.

Cobalt: 97-99%, $2.00 per lb for 550-lb keg; $2.02 per lb for 100 lb case; $2.07 per lb under 100 lb.

Columbium: Powder, $120 per lb, nom.

Copper: Electrolytic, 27.00 deld.; custom smelters, 25.50; lake, 27.00 deld.; fire refined, 26.75 deld.

Germanium: First reduction, $179.17-197.31 per lb; intristic grade, $197.31-220 per lb, depending on quantity.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $86-110 nom. per troy oz.

Lead: Common, 13.30; chemical, 13.40; corroding, 13.40, St. Louis. New York basis, add 0.20.

Lithium: 98 + %, 50-100 lb, cups or ingots $12; rod, $15; shot or wire, $16. 100-500 lb, cups or ingots, $10.50; rod, $14; shot or wire, $15, f.o.b. Minneapolis.

Magnesium: Pig, 35.25; ingot, 36.00 f.o.b. Velasco, Tex.; 12 in. sticks, 59.00 f.o.b. Madison, Ill.

Magnesium Alloys: AZ91A (diecasting), 40.75 deld.; AZ63A, AZ92A, AZ91C (sand casting), 40.75, f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $232-235 per 76-lb flask.

Molybdenum: Unalloyed, turned extrusions, 3.75-5.75 in. round, $9.60 per lb in lots of 2500 lb or more, f.o.b. Detroit.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 74.00; 10-lb pigs, unpacked, 78.25; "XX" nickel shot, 79.50; "F" nickel shot for addition to cast iron, 74.50; "F" nickel 5 lb ingots in kegs for addition to cast iron, 75.50. Prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 1.01. Nickel oxide sinter, 71.25 per lb of nickel content before 1 cent freight allowance, f.o.b. Copper Cliff, Ont.

Osmium: $80-100 per troy oz. nom.

Palladium: $21-24 per troy oz.

Platinum: $81-87 per troy oz from refineries.

Radium: $16-21.50 per mg radium content, depending on quantity.

Rhodium: $118-125 per troy oz.

Ruthenium: $45-55 per troy oz.

Selenium: $10.50 per lb, commercial grade.

Silver: Open market, 90.625 per troy oz.

Sodium: 16.50, c.l.; 17.00 l.c.l.

Tantalum: Rod, $60 per lb; sheet, $55 per lb.

Tellurium: $1.65-1.85 per lb.

Thallium: $12.50 per lb.

Tin: Straits, N. Y., spot and prompt, 91.25.

Titanium: Sponge, 99.3 + %, grade A-1 ductile (0.3% Fe max.), $2.25; grade A-2 (0.5% Fe max.), $2.00 per lb.

Tungsten: Powder, 98.8%, carbon reduced, 1000-lb lots, $3.50 per lb nom., f.o.b. shipping point; less than 1000 lb, add 15.00; 99 + % hydrogen reduced, $4.10-4.20.

Zinc: Prime Western, 10.00; brass special, 10.25; intermediate, 10.50, East St. Louis, freight allowed over 0.50 per lb. New York basis, add 0.50. High grade, 11.35; special high grade, 11.75 deld. Die casting alloy ingot No. 3, 14.25; No. 2, 15.25; No. 5, 14.75 deld.

Zirconium: Sponge, commercial grade, $5-10 per lb.

(Note: Chromium, manganese, and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 23.75-30.25; No. 12 foundry alloy (No. 2 grade), 21.75-23.00; 5% silicon alloy, 0.60 Cu max., 25.50-26.00; 13 alloy, 0.60 Cu max., 25.50-26.00; 195 alloy, 24.75-26.75; 108 alloy, 22.25-23.00. Steel deoxidizing grades, notch bars, granulated or shot; Grade 1, 23.75; grade 2, 22.00; grade 3, 20.75; grade 4, 19.00.

Brass Ingot: Red brass, No. 115, 26.75; tin bronze, No. 225, 36.00; No. 245, 30.25; high-leaded tin bronze, No. 305, 30.75; No. 1 yellow, No. 405, 22.00; manganese bronze, No. 421, 24.50.

Magnesium Alloy Ingot: AZ63A, 40.75; AZ91B, 37.25; AZ91C, 40.75; AZ92A, 40.75.

NONFERROUS PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb; nom. 1.9% Be alloy.) Strip, $1.82, f.o.b. Temple, Pa., or Reading, Pa.; rod, bar, wire, $1.80, f.o.b. Temple, Pa.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 30,000-lb lots, 32.355; l.c.l., 32.98. Weatherproof, 30,000-lb lots, 33.66; l.c.l., 34.78. Magnet wire deld., 40.43, before quantity discounts.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh.) Sheets, full rolls, 140 sq ft or more, $19.00 per cwt; pipe, full coils, $19.00 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill.) Sheets and strip, $9.50-15.95; sheared mill plate, $8.00-11.50; wire, $7.50-11.50; forging billets, $6.00-7.60; hot-rolled and forged bars, $6.15-7.90.

ZINC

(Prices per lb, c.l., f.o.b. mill.) Sheets, 24.00; ribbon zinc in coils, 20.50; plates 19.00.

ZIRCONIUM

Plate, $12.50-19.20; H.R. strip, $12.50-22.90; C.R., strip, $15.00-31.25; forged or H.R. bars, $11.00-17.40.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	126	106	128
Strip, C.R.	124	108	138
Plate, H.R.	120	105	121
Rod, Shapes, H.R.	107	89	109
Seamless Tubes	157	129	200

ALUMINUM

Sheets: 1100 and 3003 mill finish (30,000 lb base; freight allowed).

Thickness Range Inches	Flat Sheet	Coiled Sheet
0.249-0.136	43.10-47.60	.....
0.135-0.096	43.60-48.70	40.50-41.10
0.095-0.077	44.30-50.50	40.60-41.30
0.076-0.061	44.90-52.80	40.80-42.00
0.060-0.048	45.60-55.10	41.40-43.10
0.047-0.038	46.20-57.90	41.90-44.50
0.037-0.030	46.60-62.90	42.30-46.30
0.029-0.024	47.20-54.70	42.60-47.00
0.023-0.019	48.20-58.10	43.70-45.40
0.018-0.17	49.00-55.40	44.30-46.00
0.016-0.015	49.90-56.30	45.10-46.80
0.014	50.90	46.10-47.80
0.013-0.012	52.10	46.80
0.011	53.10	48.00
0.010-0.0095	54.60	49.40
0.009-0.0085	55.90	50.90
0.008-0.0075	57.50	52.10
0.007	59.00	53.60
0.006	60.60	55.00

ALUMINUM (continued)

Plates and Circles: Thickness 0.250-3 in., 24-60 in. width or diam., 72-240 in. lengths.

Alloy	Plate Base	Circle Base
1100-F, 3003-F	42.70	47.50
5050-F	43.80	48.60
3004-F	44.80	50.50
5052-F	45.40	51.20
6061-T6	46.90	53.00
2024-T4*	50.60	57.40
7075-T6*	58.40	66.00

*24-48 in. width or diam., 72-180 in. lengths.

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats	—Round— 2011-T3	2017-T4	—Hexagonal— 2011-T3	2017-T4
Drawn				
0.125	78.20	75.20	....	....
0.156-0.172	66.20	63.40	....	....
0.188	66.20	63.40	....	81.60
0.219-0.234	63.00	61.50	....	....
0.250-0.281	63.00	61.50	....	77.90
0.313	63.00	61.50	....	74.20
0.344	62.50	....	....	....
Cold-Finished				
0.375-0.547	62.50	61.30	74.80	69.80
0.563-0.688	62.50	61.30	71.10	65.50
0.719-1.000	61.00	59.70	64.90	61.70
1.063	61.00	59.70	....	59.60
1.125-1.500	58.60	57.40	62.80	59.60
Rolled				
1.563	57.00	55.70	....	....
1.625-2.000	56.30	54.90	....	57.50
2.125-2.500	54.80	53.40	....	....
2.563-3.375	53.20	51.70	....	....

Forging Stock: Round, Class 1, 45.20-58.60 in specific lengths, 36-144 in., diam. 0.375-8 in. Rectangles and squares, Class 1, 50.50-66.60 in random lengths, 0.375-4 in. thick, width 0.750-10 in.

Pipe: ASA schedule 40, alloy 6063-T6, standard lengths, plain ends, 90,000-lb base, per 100 ft.

Nom. Pipe Size (in.)		Nom. Pipe Size (in.)	
¾	$19.40	2	$ 59.90
1	30.50	4	165.05
1¼	41.30	6	296.10
1½	49.40	8	445.55

Extruded Solid Shapes:

Factor	Alloy 6063-T5	Alloy 6062-T6
9-11	45.40-47.00	60.60-64.80
12-14	45.70-47.20	61.30-65.80
15-17	45.90-47.90	62.50-67.50
18-20	46.50-48.30	64.50-70.10

MAGNESIUM

Sheet and Plate: AZ31B standard grade, 0.32 in., 103.10; .081 in., 77.90; .125 in., 70.40; .188 in., 69.00; .250-2.0 in., 67.90. AZ31B spec. grade, .032 in., 171.30; .081 in., 108.70; .125 in., 98.10; .188 in., 95.70; .250-2.00 in., 93.30. Thread plate, .188 in., 71.70; .250-2.00 in., 70.60. Tooling plates, .250-3.0 in., 73.00.

Extruded Solid Shapes:

Factor	Com. Grade (AZ31C)	Spec. Grade (AZ31B)
6-8	69.60-72.40	84.60-87.40
12-14	70.70-73.00	85.70-88.00
24-26	75.60-76.30	90.60-91.30
36-38	89.20-90.30	104.20-105.30

NONFERROUS SCRAP

DEALER'S BUYING PRICES

(Cents per pound, New York, in ton lots.) Aluminum: 1100 clippings, 13.50-14.00; old sheets, 10.50-11.00; borings and turnings, 6.50-

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES f		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tubes	Clean Heavy	Rod Ends	Clean Turnings
Copper	49.13b	46.36c	....	49.32	23.000	23.000	22.250
Yellow Brass	43.02	31.30d	43.56	45.93	17.375	17.125	15.750
Low Brass, 80%	45.50	45.44	46.04	48.31	19.500	19.250	18.750
Red Brass, 85%	46.37	46.31	46.91	49.18	20.250	20.000	19.500
Com. Bronze, 90%	47.78	47.72	48.32	50.34	21.000	20.750	20.000
Manganese Bronze	51.01	45.11	55.61	....	16.125	15.875	15.375
Muntz Metal	45.39	41.20	....	....	16.375	16.125	15.625
Naval Brass	47.27	41.58	54.33	50.68	16.125	15.875	15.375
Silicon Bronze	53.76	52.95	53.80	55.74e	22.625	22.375	21.625
Nickel Silver, 10%	59.43	61.75	61.75	....	23.625	23.375	11.813
Phos. Bronze, A-5%	68.07	68.57	68.57	69.75	23.750	23.500	22.500

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. 3% silicon. f. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time, or any or all kinds of scrap, add 1 cent per lb.

7.00; crankcases, 10.50-11.00; industrial castings, 10.50-11.00.

Copper and Brass: No. 1 heavy copper and wire, 18.50-19.00; No. 2 heavy copper and wire, 17.00-17.50; light copper, 15.00-15.50; No. 1 composition red brass, 16.00-16.50; No. 1 composition turnings, 15.50-16.00; new brass clippings, 13.50-14.00; light brass, 9.50-10.00; heavy yellow brass, 11.50-12.00; new brass rod ends, 12.50-13.00; auto radiators, unsweated, 12.00-12.50; cocks and faucets, 12.50-13.00; brass pipe, 13.00-13.50.

Lead: Heavy, 9.00-9.50; battery plates, 4.00-4.25; linotype and sterotype, 11.00-11.50; electrotype, 9.50-10.00; mixed babbitt, 10.50-11.00.

Monel: Clippings, 33.00-35.00; old sheets, 30.00-32.00; turnings, 22.00-25.00; rods, 33.00-35.00.

Nickel: Sheets and clips, 50.00-55.00; rolled anodes, 50.00-55.00; turnings, 45.00-50.00; rod ends, 50.00-55.00.

Zinc: Old zinc, 3.00-3.25; new diecast scrap, 2.75-3.00; old diecast scrap, 1.50-1.75.

REFINERS' BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Aluminum: 1100 clippings, 16.50-17.50; 3003 clippings, 16.50-17.50; 6151 clippings, 16.00-17.50; 5052 clippings, 16.00-17.00; 2014 clippings, 15.50-17.00; 2017 clippings, 15.50-17.00; 2024 clippings, 15.50-17.00; mixed clippings, 15.00-16.00; old sheets, 13.50; old cast, 13.50; clean old cable (free of steel), 16.00-16.50; borings and turnings, 13.50-15.00.

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 53.00; light scrap, 48.00; turnings and borings, 33.00.

Copper and Brass: No. 1 heavy copper and wire, 21.00; No. 2 heavy copper and wire, 19.50; light copper, 17.25; refinery brass (60% copper) per dry copper content, 18.75.

INGOTMAKERS' BUYING PRICES

(Cents per pound, carlots, delivered)

Copper and Brass: No. 1 heavy copper and wire, 21.00; No. 2 heavy copper and wire, 19.50; light copper, 17.25; No. 1 composition borings, 18.50; No. 1 composition solids, 19.00; heavy yellow brass solids, 13.00; yellow brass turnings, 12.00; radiators, 15.00.

PLATING MATERIALS

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.70 per lb.

Copper: Flat-rolled, 45.29; oval, 43.50, 5000-10,000 lb; electrodeposited, 35.75, 2000-5000 lb lots; cast, 36.25, 5000-10,000 lb quantities. **Nickel:** Depolarized, less than 100 lb, 114.25; 100-499 lb, 112.00; 500-4999 lb, 107.50; 5000-29,999 lb, 105.25; 30,000 lb, 103.00. Carbonized, deduct 3 cents a lb.

Tin: Bar or slab, less than 200 lb, 109.50; 200-499 lb, 108.00; 500-999 lb, 107.50; 1000 lb or more, 107.00.

Zinc: Balls, 17.50; flat tops, 17.50; flats, 19.25; ovals, 18.50, ton lots.

CHEMICALS

Cadmium Oxide: $1.70 per lb in 100-lb drums. **Chromic Acid:** 100 lb, 33.30; 500 lb, 32.80; 2000 lb, 32.15; 5000 lb, 31.80; 10,000 lb, 31.30; f.o.b. Detroit.

Copper Cyanide: 100-200 lb, 74.80; 300-900 lb, 72.80.

Copper Sulphate: 100-1900 lb, 14.55; 2000-5900 lb, 12.55; 6000-11,900 lb, 12.30; 12,000-22,900 lb, 12.05; 23,000 lb or more, 11.55.

Nickel Chloride: Less than 400 lb, 35.00; 400-9990 lb, 33.00; 10,000 lb, 32.50.

Nickel Sulphate: 5000-22,000 lb, 33.50; 23,000-35,900 lb, 33.00; 36,000 lb or more, 32.50.

Sodium Cyanide: 100 lb, 27.60; 200 lb, 25.90; 400 lb, 22.90; 1000 lb, 21.90; f.o.b. Detroit. **Sodium Stannate:** Less than 100 lb, 73.70; 100-600 lb, 64.80; 700-1900 lb, 62.00; 2000-9900 lb, 60.20; 10,000 lb or more, 58.90.

Stannous Chloride (anhydrous): Less than 25 lb, 162.90; 25 lb, 127.90; 100 lb, 112.90; 400 lb, 110.40; 5200-19,600 lb, 98.20; 20,000 lb or more, 86.00.

Stannous Sulphate: Less than 50 lb, 125.80; 50 lb, 95.80; 100-1900 lb, 93.80; 2000 lb or more, 91.80.

Zinc Cyanide: 100-200 lb, 59.00; 300-900 lb, 57.00.

(*Concluded from Page 279*)

within 80 to 90 per cent of capacity. Automotive lists close this week and expectations are that No. 1 grades will be off $5 or $6 a ton from prices a month ago. Quoted prices are nominal.

Buffalo—Prices on the principal grades of mill scrap, and on numerous specialties, were marked down an average of $2 a ton here last week. A further drop, possibly another $3, is anticipated next month unless the mills enter the market with substantial purchases. Cast scrap prices are steady.

Cincinnati—The scrap market is at a standstill. Stocks are piling up in dealers' yards, and the expected light mill buying won't make much dent in accumulations.

Birmingham—Prices held steady here last week, but few orders were placed by consumers. Dealers report little scrap is coming into their yards at current prices. They are reluctant to accept the prices offered them. The export market appears slightly stronger.

Seattle — Prices are steady at the lower levels attained a week or so ago. Business continues slow. Receipts at tidewater have declined.

Los Angeles—The market undertone is soft with domestic trading at a minimum and export business at a standstill. Further price reductions are anticipated.

San Francisco — Steel scrap is moving slowly here. There is little mill buying, and lower prices are expected the first of next month.

Washington—Domestic stocks of ferrous materials (scrap and pig iron) totaled 10,564,000 gross tons on Aug. 31, reports the U. S. Bureau of Mines. This was the largest quantity ever held by consumers. Scrap stocks accounted for 7,490,000 tons, and pig iron 3,074,000, each being up 7 per cent from the July 31 totals.

Domestic consumption of scrap and pig iron in August was 11,074,000 tons (5,302,000 tons scrap, 5,772,000 tons pig iron).

Scrap available for consumption in August totaled 5,771,000 gross tons, an increase of 7 per cent over July. Home scrap accounted for 3,342,000 tons, and purchases 2,429,000. Of the purchased scrap, 83 per cent came from dealers and 17 per cent from other sources.

WANTED
BAR MILL SUPERINTENDENT

Experienced, all grades of steel. Capable of assuming full responsibility. In reply enclose full resume giving experience, background, availability, age and salary requirement.

Reply Box 611, STEEL
Penton Bldg. Cleveland 13, Ohio

SALESMAN—WELDED TUBING

Expanding producer wishes to add to his Sales force. All replies kept confidential.

Reply Box 604, STEEL
Penton Bldg. Cleveland 13, Ohio

FOR SALE
OPERATING

Industrial and Marine Hardware Business; Drop Forge Plant and Dies. Patterns for Malleable, Grey Iron, and Brass.
Eastern U. S.
Box No. 608, STEEL
Penton Bldg. Cleveland 13, Ohio

FOR SALE

New HRAP Type 304 Stainless Steel
1 piece 3/16 x 12" x 240" 166 #
1 piece 3/16 x 93" x 110" 609 #
1 piece 3/16 x 90" x 250½" 1341 #
KLINE IRON AND STEEL COMPANY
P. O. Box 1013
Columbia, South Carolina

CLASSIFIED

ACCOUNT WANTED

Have been acting as factory representative eleven years. With associate call on major industrials, jobbers and wholesale hardware concerns in Ohio and Indiana. Have had ten years mill experience in cold finished steel. Now handling two accounts. Could devote time to an additional line. Reply Box 609, STEEL, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

STEEL SALESMAN WANTED. Eastern Michigan. Sheets and cold rolled strip. Prefer man familiar with territory. State qualifications and complete details. Address Box 610, STEEL, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM SUPERINTENDENT: Must have supervisory experience and be completely familiar with all phases of cleaning room operations for a miscellaneous steel jobbing foundry producing castings up to 10,000 pounds. Excellent opportunity for an aggressive qualified man with a modern and progressive foundry located in the Middle West producing 600-700 tons per month. Advise full particulars including salary requirements. Box 603, STEEL, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

MECHANICAL ENGINEER, 43, graduate, 20 yrs. experience plant engineering, forward planning, design, specifications, new construction in seamless and welded tube mills and related plant facilities. Desires to relocate as dept. head or administrative assistant. Midwest or far west preferred. Appropriate responses acknowledged. Reply Box 602, STEEL, Penton Bldg., Cleveland 13, Ohio.

TO FIND THE MAN YOU NEED . . .

Place an advertisement in the "Help Wanted" columns of STEEL's classified pages. Your advertisement will reach the qualified men you need, because STEEL is addressed to highly-trained men in all phases of metalworking

STEEL
The Metalworking Weekly

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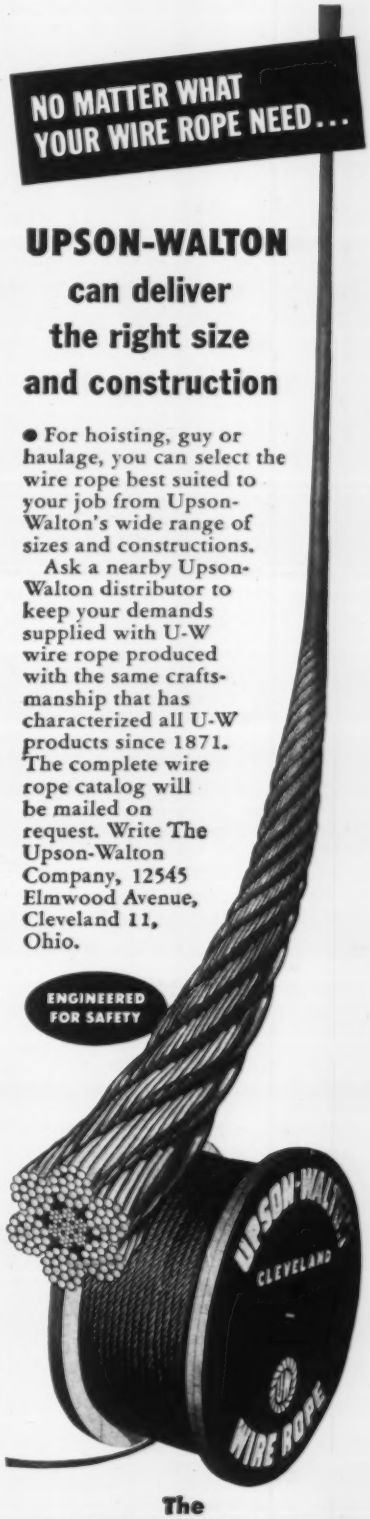
NO MATTER WHAT YOUR WIRE ROPE NEED...

UPSON-WALTON can deliver the right size and construction

● For hoisting, guy or haulage, you can select the wire rope best suited to your job from Upson-Walton's wide range of sizes and constructions.

Ask a nearby Upson-Walton distributor to keep your demands supplied with U-W wire rope produced with the same craftsmanship that has characterized all U-W products since 1871. The complete wire rope catalog will be mailed on request. Write The Upson-Walton Company, 12545 Elmwood Avenue, Cleveland 11, Ohio.



The **UPSON-WALTON** Company
SINCE 1871

Manufactures of WIRE ROPE • ROPE FITTINGS
TACKLE BLOCKS • CRANE HOOK BLOCKS
Other offices: Chicago • Pittsburgh • New York

XXIV

This is the twenty-fourth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Quenching and Tempering Alloy Steels

Of the various methods of heat-treating alloy steels, the most important is that involving quench and temper. This method, which enhances the mechanical properties of the end product, differs materially from normalizing and annealing (previously discussed in this series).

The purpose of quenching is to effect a cooling rate sufficient to develop the desired hardness and structure.

Before quenching takes place, steel is heated to a point above the transformation range. Quenching is the subsequent immersion of this heated steel in a circulated or agitated bath of oil, water, brine, or caustic; or, in the case of austempering or martempering, generally in agitated molten salt baths. Austempering and martempering are preferable where a minimum of distortion is desired.

Quenching *increases* the tensile strength, yield point, and hardness of alloy steels. It *decreases* ductility —that is, elongation and reduction of area. It also decreases resistance to impact. However, by means of tempering, it is possible to restore some of the ductility and impact-resistance—but only at a sacrifice of tensile strength, yield point, and hardness.

The results of mild oil- or water-quenching as related to mass effect can be found in the end-quench hardenability test. Voluminous data concerning this test are issued by AISI and SAE in the form of hardenability bands for the various grades of alloy steels.

If thermal cracking is to be avoided, cooling by liquid quenching should not be carried to a point below 150 deg F. When a temperature of 150 deg F is approached, immediate tempering should follow. Because of residual stresses, no steel should be used in the as-quenched condition.

Tempering can be defined as reheating to a specified temperature below the lower critical range, followed by air cooling. It can be done in furnaces, oil, or salt baths, the temperatures varying from 300 to 1200 deg F. With most grades of alloy steel, it is best to avoid temperatures between 500 and 700 deg because of the "blue brittleness" that occurs in this range. Maximum hardness and wear-resistance result from tempering at low temperatures; maximum toughness is achieved by tempering at the higher levels. Of course, one of the essential reasons for tempering is to relieve the residual stresses set up in quenching.

Bethlehem metallurgists have devoted years of study to quenching, tempering, and other phases of heat-treating. By all means call them if they can be of service to you. And please remember, when you are next in the market for alloy steels, that Bethlehem makes all AISI standard grades, as well as special-analysis steels and the full range of carbon grades.

If you would like reprints of this series of advertisements from No. 1 through No. XX, please write to us, addressing your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. The first 20 subjects in the series are now available in a handy 36-page booklet, and we shall be glad to send you a free copy.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Above—Cleveland-powered positioner has turned a hopper car 90 degrees on its horizontal axis. It can rotate this car through 360 degrees.

With CLEVELAND 70-ton Hopper Car is positioned for welding in 3 minutes flat

SMOOTHLY and without strain, this giant positioner, designed and built by Pandjiris Weldment Co., St. Louis, lifts and turns even the largest railroad hopper car. Two men in three minutes perform an operation over which a crew of eight used to sweat for hours. A key component of this great machine is the Cleveland worm gear speed reducer.

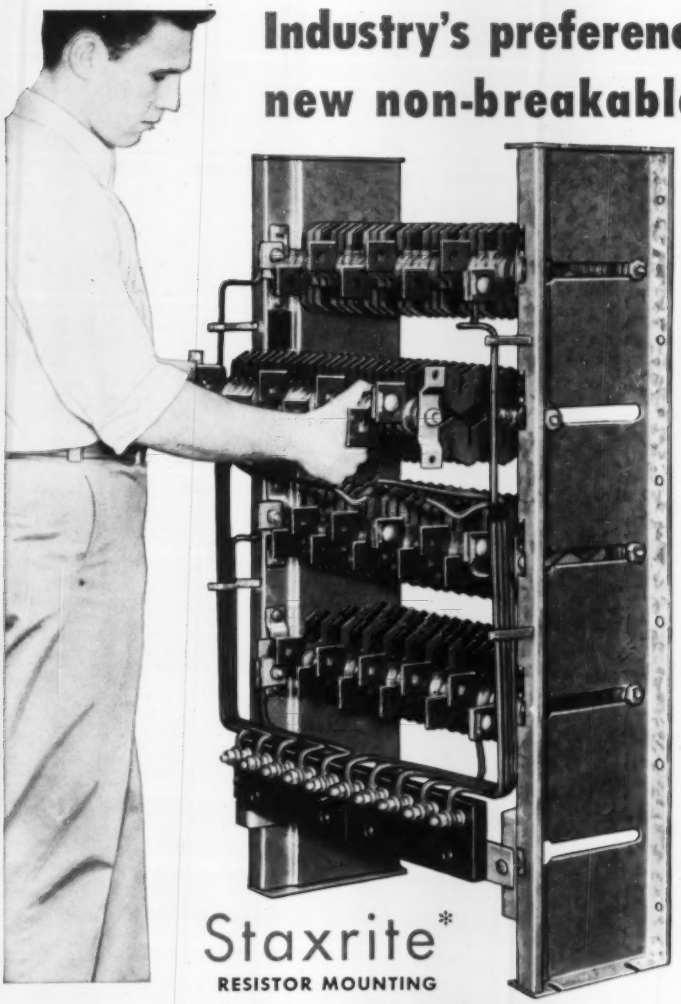
Wherever you need a space-saving, dependable, right-angle drive, you can use a Cleveland with confidence. There are hundreds of thousands of Cleveland worm gear drives in service today, many of them still on the job after twenty, thirty, forty or more years of continuous operation.

Clevelands are made in types and sizes to meet practically every requirement. And every one is a precision-engineered, quality product, built for a lifetime of trouble-free service. Write for Bulletin 145 for complete details. The Cleveland Worm & Gear Company, 3270 E. 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers, Limited.

CLEVELAND
Worm Gear
Drives

Industry's preference... Cutler-Hammer's new non-breakable Mill Duty Resistor



Cuts costs during installation, maintenance and alterations. Exclusive C-H "Draw-out" designed resistor units slide in and out of position easily and quickly without disturbing the end frames, adjacent resistor units or mounting members. "Draw out" design cuts costly "down time" to a minimum. Any resistor can be withdrawn and replaced by a spare in a few minutes.

Difficult resistor mounting problems made easy with Staxrite. Saves valuable space . . . Staxrite mounting frame, available in graduated sizes up to nine resistor units high, only requires the floor area of one resistor box. Complete terminal board wired assemblies practically eliminate costly on the job wiring. Unwired assemblies also available.

Exclusive "Draw-out" Design and Staxrite, the All New Resistor Mounting Frame, Have Made the Cutler-Hammer 11011 Mill Duty Resistors the Choice of Men Who Know

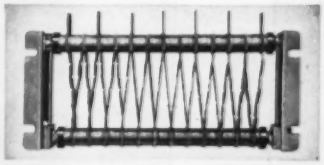
Cutler-Hammer, leading mill control designer and manufacturer for 63 years, is "first" again with "Draw-out" designed mill duty resistors and Staxrite, the multiple resistor mounting frame. Cutler-Hammer's 11011 resistor featuring exclusive "Draw-out" design, installs easier, works better and lasts longer.

The C-H 11011 resistors are non-breakable, rugged, vibration proof, and corrosion proof. Staxrite, a new concept in resistor mounting, offers new savings in space . . . More resistor material for each square foot of floor area. Staxrite saves installation time. No more box-by-box mounting. For complete information on the C-H 11011 non-breakable resistor, Staxrite mounting frame and all types of mill duty control, write or wire today. Your inquiry will receive prompt attention.

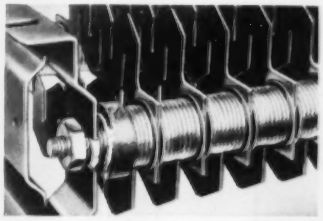
CUTLER-HAMMER, Inc., 1211 St. Paul Avenue, Milwaukee 1, Wisconsin. Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ontario.

*Staxrite is a Cutler-Hammer Trademark

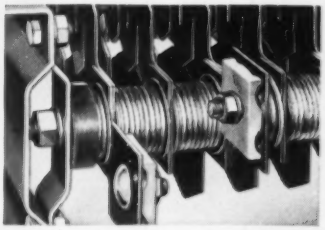
Accurate current and voltage regulation—Stamped chrome-steel grids (not cast) maintain a fixed, reliable resistance value... a must for machinery requiring precise regulation. Shock-proof, vibration-proof, corrosion-resistant and non-breakable.



Higher current capacities—Unique "over-under" grid pattern allows wider clearance between grids for maximum air circulation and rapid, sure heat dissipation. C-H resistors work harder. C-H resistors last longer.



More rugged but less weight—Welded grid joints form a rugged, continuous current path. No more heavy grid tie-rods. No more pressure dependent grid contacts. Note—New floating rod construction eliminates grid stresses and distortion due to thermal expansion.



Easy to wire terminals—Hefty projected terminals are staggered for wiring simplicity. Terminal-grid weld insures positive electrical contact—can't shake loose. Note the steel spacing washers and heavy-duty mica insulators . . . the mark of sturdy, rigid resistor construction.

CUTLER-HAMMER
MOTOR CONTROL
C-H